



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>



AC
7
A55

RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS,
AND
MISCELLANEOUS LITERATURE.

BY
JAMES ANDERSON, LL.D.

FRS. and FSA. E.

Honorary member of the Society of Arts, Agriculture, &c. Bath; of the Philosophical Society, Manchester; of the Agricultural Society, Altringham; of the Philosophical Society, Newcastle; of the Society for promoting Natural History, London; of the Academy of Arts, Sciences, and Belles Lettres, Dijon; of the Royal Society of Agriculture, St. Petersburg; of the Royal Economical Society, Berlin; of the Philosophical Society, Philadelphia, correspondent member of the Royal Society of Agriculture, Paris; and author of several performances.

KNOWLEDGE IS POWER. BACON.

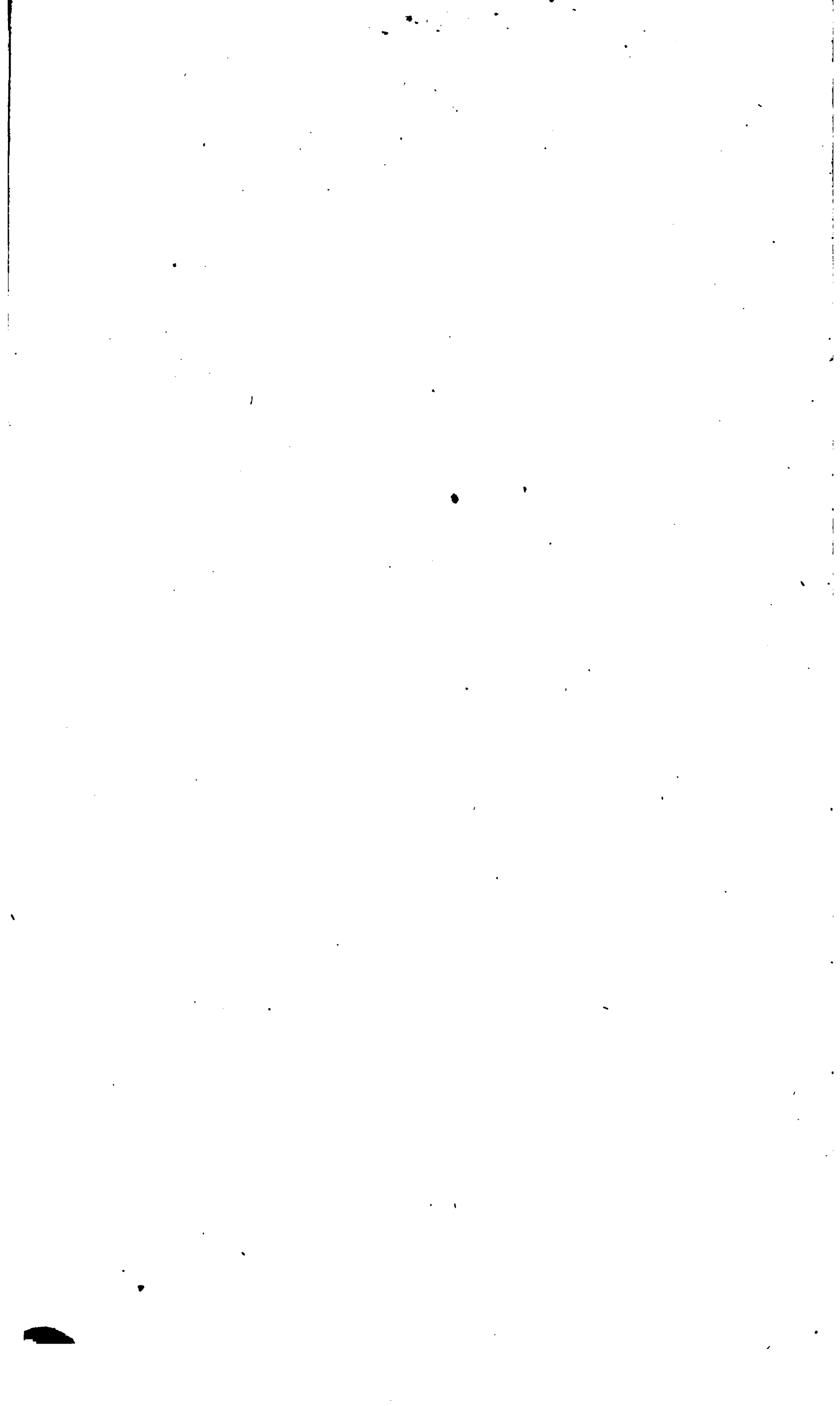
VOL. IV.

LONDON:

PRINTED BY S. GOSNELL,
Little Queen Street, Holborn;

And sold by **JOHN CUMMING, No. 40, Holborn Hill.**

1803.



RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS,
AND
MISCELLANEOUS LITERATURE.

BY
JAMES ANDERSON, LL.D.

FRS. and FSA. E.

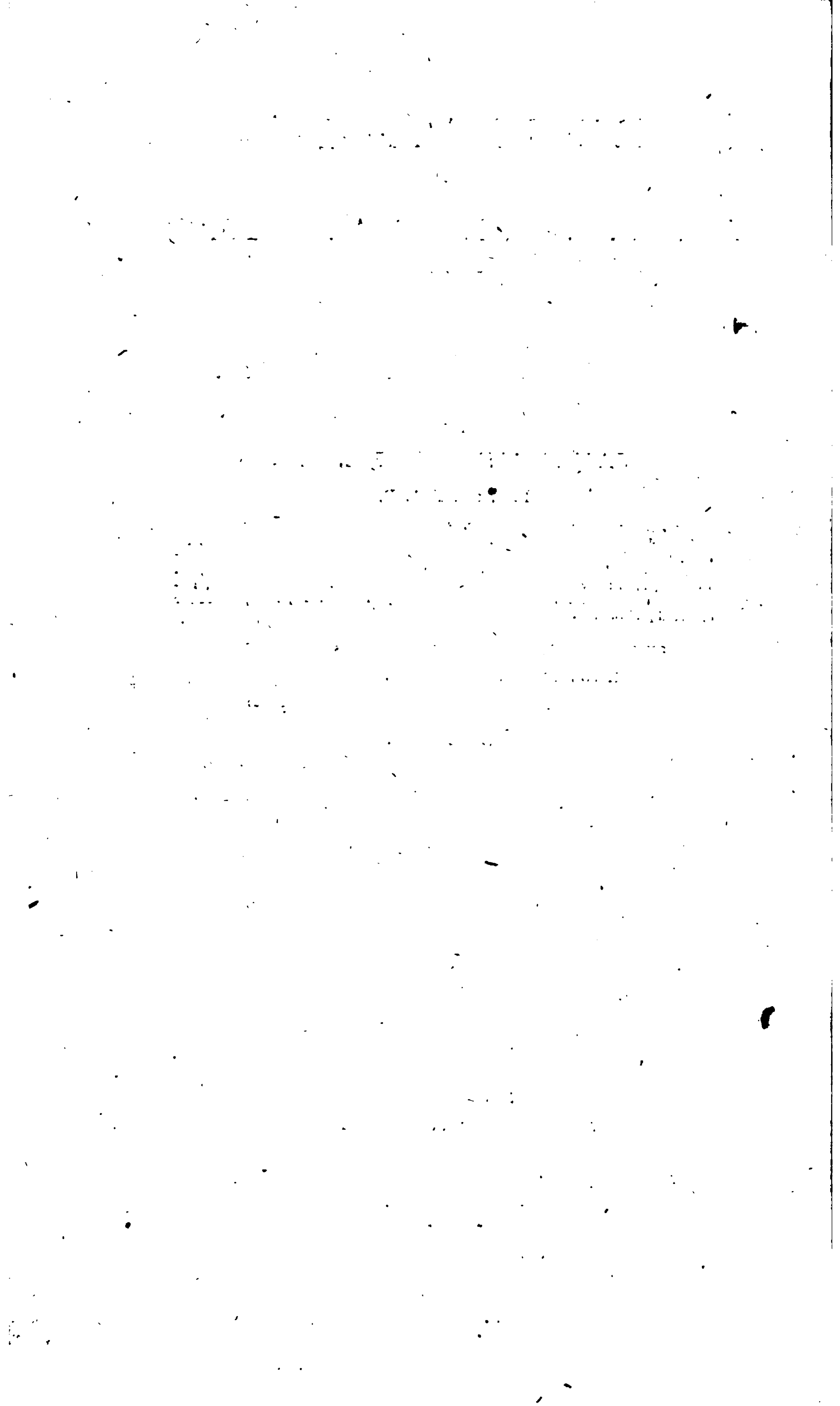
Honorary member of the Society of Arts, Agriculture, &c. Bath; of the Philosophical Society, Manchester; of the Agricultural Society, Altringham; of the Philosophical Society, Newcastle; of the Society for promoting Natural History, London; of the Academy of Arts, Sciences, and Belles Lettres, Dijon; of the Royal Society of Agriculture, St. Petersburg; of the Royal Economical Society, Berlin; of the Philosophical Society, Philadelphia, correspondent member of the Royal Society of Agriculture, Paris; and author of several performances.

KNOWLEDGE IS POWER. BACON.

VOL. IV.

LONDON:
PRINTED BY S. GOSNELL,
Little Queen Street, Holborn;
And sold by **JOHN CUMMING, No. 40, Holborn Hill.**

1803.



English
Arch.
3-20-33
27976

19.

SEPTEMBER 1800.

RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 1. VOL. IV.

AGRICULTURE.

PRACTICAL REMARKS ON THE MANAGEMENT
OF THE DAIRY, PARTICULARLY IN RESPECT
TO THE OBTAINING OF BUTTER.

[Continued from Vol. III. page 419.]

Part 7th. *On the Utensils for the Dairy.*

IN giving practical directions for rural operations, the writer ought always to be understood to be addressing himself to persons who are unacquainted with the particulars investigated, and desirous of being informed; and, as much of the success of these operations depends upon minutiae which might not at first occur to a novice, and thus occasion unnecessary em-

VOL. IV.

B

03-24-23 12512

barraissement, and casual want of success, that experience has discovered to be of importance, and practice taught how to simplify, it becomes necessary not to overlook details that the supercilious pride of genius might reckon puerile. Of this nature are the objects which at present demand our attention.

The utensils of the dairy must, in general, from the nature of the business, be made of wood. But of late, many persons who affect a superior degree of elegance and neatness, have fallen into the practice of employing vessels for various purposes in the dairy, made of lead, or common earthen-ware, both of which ought to be carefully excluded; for, as the acid of milk very readily dissolves lead, brass, and copper, and with these metals forms a compound that is of a poisonous nature, such vessels must ever be highly pernicious when employed for these purposes, and therefore cannot be too cautiously guarded against. I have not myself a doubt, that the frequency of paralytic complaints of late years is in a great measure to be attributed to the common use of such vessels for the purpose of preserving milk, butter, pickles, and various other kinds of food every where common at our tables; for, as all the common kinds of earthen-ware are glazed with the glass of lead, which is soluble in every acid, and with all of them forms compounds of a nature highly deleterious, there can be no doubt but the very general use of earthen jars for containing articles of this nature, must be the means of introducing, almost at every meal, draughts of poison; in such small doses indeed, that they are not sufficient to produce a sensible effect at the moment; but, by being so often re-

peated, they must at length impair the constitution, and produce those humiliating diseases which render life, to so many persons in the evening of their time, burthensome to themselves and others. I therefore recommend this particular to every well disposed mistress of a family as an object of very serious attention: nor let them consider it as a light affair. It is not many years since the inhabitants of the cider counties were frequently distressed by a most excruciating disease, known by the name of the *Devonshire colick*, which it exceeded the power of the physicians to remove, and baffled their skill to account for, till at length some person of sagacity observed, that the vessels commonly employed in that county for containing the cider after it was drawn from the cask, as well as the mugs for drinking out of, were made of such earthen-ware, which immediately explained the paradox.

Fashion, however, having once introduced among *fine folks* a dislike to wooden utensils for the dairy, an ingenious gentleman, a Mr. Hayes, with a view to humour the whim of the day, proposed to substitute vessels made of cast iron instead of those of lead or earthen-ware; but this also is objectionable; for iron likewise is easily soluble in acids; and though this solution be not so hurtful as the others, yet it still communicates a taste that might be disagreeable; and might also, under certain circumstances, greatly affect the colour of the products of the dairy; so that these also should be avoided. In short, I know of no kind of material but wood of which dishes for the dairy could be made, with any reasonable prospect of safety to the

health and propriety in other respects, except the purest porcelaine from China, or glafs: and both these are too expensive ever to come into general use among sensible dairy-owners: nor will the judicious husbandman ever think of employing any other than wooden utensils. This fact is, in general, so universally admitted; as to render wooden dairy utensils common in most parts of the country; so that they can be readily procured every where, of a proper quality and form of construction: it becomes unnecessary, therefore, to enlarge on these particulars.

The creaming dishes (so I call the vessels in which the milk is set to throw up the cream) when properly cleaned, sweet, and cool, are to be filled with the milk as soon after it is drawn from the cow as possible; having been first strained carefully through a close strainer, usually formed of a large wooden bowl (in some places a deep-edged sieve) with a hole at the bottom, covered at times with a very close sieve of fine wire (silver wire is best) sometimes with fine gauze, or close hair web woven for that purpose, so as to keep back hairs, &c. that may have accidentally fallen into it from the cow. The creaming dishes should never exceed three inches in depth, whatever be their other dimensions; for, by exposing such a large surface to the air, the milk will be quickly cooled, which is attended with many advantages; and the cream will be more quickly separated than would otherwise happen. If the plan before recommended, of separating the milk into two parts, and of keeping each cow's milk by itself, be adopted, it will be convenient to have them made of such dimensions as to contain about one and a half,

or two gallons (English) each. As soon as they are filled, they should be placed where they are to remain; or, should they be set in a cooler situation than the common shelves to cool a little during very hot weather, they should be removed with the utmost caution, so as to disturb the milk as little as possible.

The length of time that should elapse before the cream is separated, will depend on the degree of heat at the time, and the particular views of the owner of the dairy. In a moderately warm temperature of the air, if very fine butter be intended, it should not be allowed to stand more than six or eight hours. For ordinary good butter, it may safely be let stand twelve hours, or more: but where the dairy is so large as to afford a sufficient quantity of cream, and where the very best butter is intended (the milk being meant to be converted to some other use while yet sweet) it may be separated after standing only two, three, or four hours.

When the cream is to be taken off, the milk-pan should be placed on the table. The cream is then to be separated from the edges of the vessel (to which it firmly adheres) by means of a thin ivory knife to be provided for that purpose, which should be made to run round the edges of the whole. The cream should then be drawn carefully toward one side by means of a skimming-dish, made of box or some kind of firm wood that admits of being worked to a very thin edge (better of ivory, if that can be obtained of a sufficient size), and then lifted carefully up, so as to take the whole of the cream without any of the milk, if possible. This requires a manual dexterity that can be attained

only by practice; but it is of importance to the success of the dairy that it be well done; for, if any part of the cream be left, the *quantity* of butter will be diminished; and if any part of the milk be retained, its *quality* will be debased.

When the cream is thus obtained, it ought to be immediately put into a vessel by itself, there to be kept till a proper quantity be collected for being made into butter: and no vessel can be better adapted for that purpose, than a firm neat-made wooden barrel, of a size proportioned to the size of the dairy, open at one end, with a lid exactly fitted to close it. In the under part of this vessel, close to the bottom, should be placed a cock or spigot, for drawing off from time to time any thin serous part of the milk that may chance to be there collected; for, should this be allowed to remain there, it acts upon the cream in a powerful manner, and greatly diminishes the richness of the butter. The inside of the opening into the cock should be covered with a bit of close fine wire netting, or fine gauze, to keep back the cream, while the serum is allowed to pass; and the barrel on its stand should be inclined a little forward in the top, to allow the whole to run off.

Many persons who have had little experience in the dairy believe, that no butter can be of the finest quality, unless it be that which has been made from cream that has not been kept above one day; but this is a very great mistake. So far, indeed, is this opinion from being well founded, that it is in very few cases that even tolerably good butter can be obtained from cream that is no more than one day old. The separation of

butter from cream, as well as that of cream from milk, only takes place after the cream has attained a certain degree of acidity. If it be agitated before that kind of acidity has begun to take place, no butter can be obtained, and the agitation must be continued till the time that that sourness is produced, after which the butter begins to form. In summer, while the weather is warm, the beating may be, without very much difficulty, continued till the time that that sourness is produced, so that butter may thus be obtained; but in this case the process is long and tedious; and the butter is, for the most part, of a soft consistence, and tough and gluey to the touch. If this process be attempted during the cold weather in winter, butter can scarcely in any way be obtained, unless by the application of some great degree of heat, which sometimes assists in producing a very inferior kind of butter, that is white, hard, and brittle, with very little taste, that is almost unfit for any culinary purpose whatever.

The judicious farmer, therefore, will not attempt to imitate this practice; but will allow his cream to remain in the vessel appropriated for keeping it, until it has acquired that proper degree of acidity which fits it for being made into butter with great ease, by a very moderate degree of agitation, and by which process only can very fine butter be obtained.

How long cream must be kept before it attains the precise degree of acidity that is necessary to form the very best butter, and how long it may be kept after that period before its quality be sensibly diminished, has never yet, in as far as I know, been ascertained by experiments that can be relied upon: it must, no

doubt, vary according to circumstances. So little nicety, however, has been observed in this respect by practical farmers, and even by those who have a high reputation for making the best butter, that few of them ever think of observing any precise rule in this respect with regard to the different portions of their cream; they, in general, make into butter at once all the cream that they have collected since the former churning, however long or short that interval may have been; so that the cream of various ages is all made into butter at the same time: nor can I find any thing like a uniform rule established among them as to the time that should intervene between one churning and another, that being usually determined by casual or local considerations. From this circumstance, I should be led to suppose, that, if the cream be properly kept, it is of small moment. I am myself inclined to believe, that if it be kept in a due temperature, and no serious matter allowed to lodge about it, a very great latitude may safely be admitted in this respect. What is the utmost length of time that cream may be kept in our climate without rendering the butter made from it of a bad quality, I cannot say; but I can pronounce with certainty, that it may be kept good for a much longer time than is in general suspected, even for several weeks: nay, I have been assured in the most serious manner, that a lady who has now been dead many years, and who was noted for always having very fine butter of her own making, used to churn only twice or thrice during the season; but of this I cannot speak from my own knowledge. The subject is curious considered as a physical fact; but as to econo-

mical purposes, it seems to be of little moment. It is enough that we know to a certainty, which is doubtless the case, that cream which has been kept three or four days in summer is in excellent condition for being made into butter; and I am inclined to believe, that from three days to seven may be found the best time, in general, to keep cream before churning it; though, if circumstances make it necessary, a considerable latitude in this respect may be allowed.

If, however, any farmer should have such a quantity of cream as could afford a sufficiency to be worthwhile to churn it once a day, and should he find it would add either to his profit or his comforts to churn every day, there is nothing to prevent him from doing it. He needs only to provide a separate vessel for holding the cream for each day that he means it should stand before it be churned: if three days, three vessels; if four days, four vessels; and so on. Thus he might churn every day cream of three days old, or of four, or any other number of days old that he may choose.

In some parts of the country a practice prevails, of churning the whole of the milk without separating any of the cream. In this way they obtain a greater weight of butter, though it be of an inferior quality. By careful management however, especially if a portion of the first drawn milk be separated, very good butter may be thus obtained. The operation of churning is in this case a very heavy employment; and, on many accounts, I think the practice is not to be recommended.

The vessel in which butter is made, usually called a *churn*, admits in the form of it a considerable diver-

sity. The simplest that I have seen I should prefer as the best, merely because it admits of being better cleaned, and of having the butter more easily separated from the milk than many of the others; I mean the old fashioned upright churn, having a long handle with a foot to it perforated with holes, for the purpose of beating the cream by being moved upward and downward by hand. But though, for the reasons assigned, I myself should prefer that form of a churn, other persons may choose that which they like best; as all the sorts, under skilful management, will perform the business perfectly well. Indeed, if the cream be prepared as above directed, the process of churning will be so easy, as to render those utensils in general the most commodious which can be the most easily emptied.

In the process of churning, much greater nicety is required than most persons seem to be aware of. A few hasty irregular strokes may render the whole of the butter of scarcely any value, which, but for this circumstance, would have been of the finest quality. The owner of an extensive dairy, therefore, should be extremely attentive to this circumstance, and should be at great pains to procure a proper person for managing this branch of business. This person ought to be of a cool phlegmatic temper, sedate disposition and character, and ought never to allow another person, especially those who are young, to touch the churn, without the greatest caution and circumspection. Those who have been used to see cream churned that has not been properly prepared, will think, perhaps, that this would be severe labour for one person in a large dairy;

but nothing is more easy, as to the bodily labour it requires; than the process of butter-making, where the cream has been duly prepared.

The butter when made must be immediately separated from the milk, and being put into a clean dish (the most convenient shape is that of a shallow bowl), the inside of which, if of wood, should be well rubbed with common salt, to prevent the butter from adhering to it. The butter should be then pressed and worked with a flat wooden ladle, or skimming-dish, having a short handle, so as to force out all the milk that was lodged in the cavities of the mass. A considerable degree of strength, as well as of dexterity, is required in this manipulation. The thing wanted is to force out the milk entirely, with as little tawing of the butter as possibly; for if the milk be not entirely taken away, the butter will infallibly spoil in a short time, and if it be much worked, the butter will become tough and gluey, which greatly debases its quality. This butter is in some places beaten up by two flat pieces of board, which by those who can do it answers very well.

Some persons employ cold water in this operation, which they pour upon the butter, and thus, as they say, wash it; but this practice is not only useless, as the butter can be perfectly cleared of the milk without it, but also pernicious, because the quality of the butter is thus debased in an astonishing degree. Nothing is so hurtful in a dairy as water improperly used; which, if mixed in any way with either milk or butter, tends greatly to debase the quality of the last.

When the butter is entirely freed from the milk, if it is to be sold sweet, it may be made up into any

form that is most generally liked at the market where it is to be sold. If the heat should be so great as to render it too soft to receive the impression of the mould, it may be put into small vessels, which may be allowed to swim in the trough of cold water under the table, but without allowing any of that water to touch the butter; there it will in a short time acquire the necessary degree of firmness (especially if a little bit of ice shall have been put into the bason), after which it may be taken out and moulded into proper form. It should then be put down, in proper dishes, upon the stone border that surrounds the trough, where it may be kept cool and firm till it be packed up to go to market.

[To be concluded in our next.]

For Dr. Anderson's Recreations.

**OBSERVATIONS ON SPARROWS, AND OTHER
DESTROYERS OF CORN.**

SIR,

Preston, Aug. 8, 1806.

HAVING found some advantage, no little information, together with a great deal of amusement, in the perusal of your Numbers, and as you seem inclined to adopt the opinions and sentiments of others, when they fall in with your plan of conveying knowledge to others, I have been induced to give you my ideas on a subject which appears to me to deserve much public attention, and which (I beg pardon for the liberty) you seem to have passed over slightly: I mean the destruction of those animals which counteract the labours, and frustrate the hopes of the

farmer, by consuming the corn which would otherwise come into the market.

In the first place I shall take notice of the sparrow, which you represent only as an enemy to gooseberries, and, as a recipe to prevent it, advise your readers in your eighth Number to supply them with a little nourishing food well adapted to their palate. I suppose you mean a few oats, pease, beans, and now and then a little wheat, by way of a rarity; but it so happens, that these plunderers are not contented with a little, nor are they satisfied with a great deal. In fact, I look upon the sparrow to be the greatest enemy to man: and it would be found worthy of an enlightened legislature to hold out premiums for their destruction.

It is recorded in history, much to the honour of the then reigning prince Edgar, that he took great pains in hunting and destroying the wolf, and when he found that all which had escaped him had sought their safety in the woods of Wales, he changed the annual tribute, which the Welch were accustomed to pay, into a tribute of three hundred heads of wolves, and in a short time utterly extirpated the whole race. Would it not, sir, add equal lustre to the glorious reign of our beloved sovereign, if an act was passed in parliament holding out a reward sufficient to engage farmers'-boys and others to take pains to destroy them? It might be easily done: and I am confident that the saving to the nation in corn, &c. in one year, would fully answer all the expence. The present reward (for I believe there is a halfpenny a head allowed by law, but which is rarely put in execution) is not sufficient.

In your travels over the kingdom you must often have been witness to the immense flocks of these birds which infest the corn fields, and every farm-yard resounding with their notes, whilst every head-land near the house is totally laid waste, hardly a grain of corn to be found within some yards of the fences.

It is an old saying, that nine sparrows destroy as much corn as a man! How far the remark may be just, I am not competent to determine; nor do I know any data by which it may be determined: but of this I am confident, that the number of these delinquents are far more than nine times the number of inhabitants; and which, if the above remark be just, it will evidently appear that this destructive bird consumes more food than the inhabitants of the island. This, perhaps, may appear to be rather outrè: but if we consider the destruction made in a field, whilst the land is new sown, the havoc when near ripe, when cut but yet standing in the field, and the depredations in the barns during the rest of the year, into which they have always free ingress and egress at all times and seasons, the loss will be found to be immense, and beyond all calculation.

There is still another circumstance which will point out the advantage of having this bird destroyed, and which I have never seen any one take notice of; which is, that one bushel of corn grown in the country is worth double, if not treble, the quantity imported. This may seem at first sight a paradox likewise. But, sir, let us view it through its different stages, that we may come to the truth. You will, therefore, come along with me into the public grana-

ries in Germany, Poland, &c. from whence the corn is imported. Our travelling expences will not be heavy.

You see there laid up in that warehouse above a hundred different crops from different kinds of land, good, bad, and indifferent, heaped promiscuously together, waiting for a purchaser; when out comes a bounty for the sudden importation; the vessel sails, whilst the merchant has only one idea, which is to carry away the prize for the first importation, and a speedy market, and, without much examination, it is shipped on board: for it is the quantity, not the quality, which entitles him to it. And when it arrives, I need not tell you in what state it is too often found.

It is then bought up by jobbers, forestallers, who, rather than sell at a reasonable gain, endeavour by very unjust means to let it come but slowly out from their warehouses, so as to keep up the market, and sooner than sell it on reasonable terms, keep it close up till a great part of it becomes of little value, or rather worth nothing, the remainder is carried away in the night so damaged that it is not saleable, and thrown into the rivers: but it has answered their ends. By what they have sold, they have amassed riches; thus enabled by their iniquitous practices to continue on in their iniquity.

What corn is grown in the country is not so liable to such risk. The farmer brings it to market regularly. It is his advantage that it should be in high condition: and no doubt he would have a far greater quantity if not destroyed, as above stated, by the spar-

rows. A good premium, ordered to be paid out of the land-tax, would soon totally extirpate the breed.

If these remarks, put down in a hurry, be found worth your attention, you will arrange them better according to your own way, and the great circulation of your valuable papers may, perhaps, stimulate some well-wisher to his country to step forward in the house, and propose some means for their destruction. If rats, contractors, jobbers, &c. came under the same law, we should have corn in plenty. I remain, sir, your obedient servant,

COLIN CLOUT.

It always pleases me to find a person who thinks for himself, and writes what he thinks. If, on some occasions, a young person should shoot a little beyond the mark, not much harm will be done by it. He may come nearer it when he next bends his bow. The path is thus, as it were, pointed out to another; he is stimulated to step forward when he might have otherwise loitered away his time in indolence. There is a good deal of truth in some of these hasty touches of my young correspondent, and they point at several things that deserve attention, and that may lead to more important conclusions than are at first sight apparent. I avoid at present any further critique or observations, with a view to encourage young investigators to continue their researches, which will ultimately prove not less beneficial to themselves than the public. The youthful vivacity, and sarcastic slyness of some of these combinations, are far from being unpleasing to me.

NATURAL HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

[Continued from Vol. III. page 441.]

On the Metamorphoses and Habits of the Coccus tribe, or Gall Insects.

To a person who has made a considerable progress in the study of insects, few things appear astonishing, because he has been so often accustomed to meet with phenomena respecting these minute creatures that differ entirely from those which are observable among the larger animals on this globe, that he is prepared to expect them: but he who has just begun to enter upon that study feels as if he were in a region of enchantment, where phenomena of the most surprising nature are perpetually soliciting his notice; and he is, as it were, perplexed and lost between alternate sensations of doubt, admiration, and wonder. The diversities of changes and modes of life that take place in the very few that have been already enumerated in this work, during their different periods of existence as it may be called, are very great; and the object of our present recreation furnishes another diversity, not less surprising than any of those that have gone before it.

Few persons would imagine, that there could long remain room to doubt, whether an object that is so accessible as to be within the reach of our sight and touch during the whole period of its existence belonged to the animal or the vegetable kingdom; yet this is so

much the case with regard to these objects, that for many centuries they were believed, not only by the vulgar, but by the most skilful naturalists, to be nothing more than a sort of wens formed by the extravasated sap of certain vegetables; and it was not till near the present century that doubts began to be entertained upon that head; the matter then remained for half a century in doubt, and afforded subject for many a learned dissertation on both sides: at last, the contest was terminated by some decisive facts observed by Reaumur, and which have been confirmed by all future observers; so that they are now known and universally recognised as a class of animals, whose transformations are as regular, and whose habits are as invariable, as those of any other insect that exists, though they are very unlike to any that were known before this discovery was made.

There are many varieties of this class of insects. Some of these are very common in every kingdom in Europe, and some of them of great value in commerce and in arts; so that they have been long known. As their general transformations and habits are much the same, one description, with a few trifling exceptions, may apply to the whole.

The *coccus* tribe, when they have attained to such a size as readily to attract the notice of man, assume the appearance of a small protuberance upon the tender twigs, leaves, or bark of certain trees, which gradually swell to a larger size, till they attain their full magnitude, without ever quitting the place where they were first observed, or making any kind of motion that can give the smallest indication of animal life. These

kinds differ from each other in size, form, and colour; but for the most part they are somewhat of a spherical form, more or less oblong. At an early period of their growth they are flat, rising very little higher than the bark of the shoot to which they adhere, and are chiefly then distinguishable by their colour. As they augment in size they swell higher in the middle than they extend in their other dimensions, so as to rise on some occasions above the height of a semi globe, or spheroid; but in general they adhere close to the bark with their flatted side, which appears as if a part of the regular figure had been cut off for that purpose. The kinds which become most prominent so much resemble those excrescences which grow on many plants in consequence of the wounds produced by certain insects, and known by the name of *galls*, that they were long believed to be of the same nature; for their outer covering is generally firm and unyielding, like that of the galls; so that after they were known to be animals, Reaumur, and several other naturalists, called them *gall-insects*.

The most common insect belonging to this class in Europe is one that attaches itself to the peach tree; it is of an oblong form, and, when it has attained its full size, assumes an appearance somewhat like that of a boat reversed. Neither feet, nor eyes, nor other members common to animals, are discoverable upon it while in this state; but at one of its ends may be perceived a small opening, that does not apply close to the tree, very like that in the end of those beautiful Indian shells that are often made into snuff-boxes, and called *couries*, only it is not so clearly discernible.

in the insect as the shell. When narrowly examined, it is found that a thin film, of a white cotton-like substance, is interposed between the flat part of the body of the insect and the tree, which gradually grows thicker as it comes nearer to maturity. This is common to all the species; but in some the cottony matter is much more abundant than in others, and is particularly perceptible in one species which is often seen on vines in this country that are reared in a house.

When the peach coccus has attained to its fullest size, it is of a brownish colour, and is found, upon dissection, to have its whole body filled with eggs, with scarcely any viscera that are perceptible. Its upper surface, or back, is hard, like a kind of shell; its under surface, or belly, is a soft skin, and applies quite close to the tree, under which are observable the traces of its legs, now nearly obliterated. The cotton-like substance appears at first all round the edge, as a kind of cement to join it there close to the tree. When the insect has attained to its full maturity, the eggs are gradually extruded from the abdomen, without any external motion, through a small opening near to that end where the little cavity, before mentioned is placed. These eggs, when once on the outside of the abdomen, are forced forward one after another towards the other end, which would be in common language called the head. In this way the whole number of eggs (sometimes to the amount of four thousand) successively pass from the inside to the cavity under the outside of the belly, which is gradually enlarged as the cavity within becomes emptied; till at last, when the

whole of the eggs are laid, the skin of the belly, instead of adhering to the tree, as at first, assumes a concave form, so as to apply close to the back, the few viscera being scarcely perceptible. And now the animal, having performed all the functions that nature intended, ceases to exist, without having ever made the smallest perceptible motion during all this time. It remains of course, after it is dead, fixed to its place as before, and serves as a covering to protect the eggs till they are hatched, and the young brood till their members have attained the necessary degree of firmness to enable them to perform the functions allotted to them.

The brood are not all hatched at one instant. Those eggs that were first laid become first vivified; and the young no sooner feel their animal powers, than they begin to look about for food. They make their exit successively by the aperture in the upper covering already mentioned, which has evidently been provided by nature for that and other concomitant purposes. At this period of its existence, the insect is an active little creature, of an oblong shape and whitish colour, and runs about every where with great celerity. It is provided with two small antennæ, a pair of eyes, and six legs. Instead of a mouth, it is provided with a small protuberance, somewhat like a nipple, on the under part of the breast. It continues thus active for a few days, running from place to place with a considerable degree of agility, till at length it fixes itself by means of the nipple to some tender part of the tree, in general to the leaves or young shoots of the same year; for it is usually brought to life in the month

of May. After it has thus attached itself to the leaf, it remains there without motion under the appearance of a thin whitish scale; for the body, in this its larva state, appears to have superficial extent with very little depth. Its legs are concealed under the scale; so that in this, as well as in its perfect state, it has not the most distant appearance of animation.

This creature, however, possesses a locomotive faculty for many months, probably all the while it is in its larva state, during which time it, no doubt, changes its skin several times; but how often has not yet been ascertained. Mr. Reaumur discovered a way to put this insect in motion: for, having plucked off some of the leaves on which they had fixed themselves, and brought them into his closet for the purpose of observing them, he remarked, that so long as the leaves continued fresh and succulent, they remained in their place without any motion; but when the leaves began to dry and shrivel up, the larvæ quitted their hold, abandoned the leaves, and went about in search of food elsewhere. He afterwards observed, that when the leaves fell from the tree of themselves in autumn, the same thing took place. Though they were full of scales at the time they fell, in the space of two days not one was to be found upon them. They quitted the leaves, and, mounting the tree, attached themselves to the tender and succulent parts of the bark, especially the young shoots, and still more particularly the tenderest tops of these shoots; where they may be often found in such numbers as almost to cover the whole.

In this state they remain during the winter, still making some advances in growth. But it is not till

the month of April, after it has cast its last skin, and assumed its perfect state, that the insect loses its scale-like form, acquires with rapidity that thickness, and swells into that rotundity of shape already described. Now also it has totally lost its locomotive powers; for, if the branch to which it adheres be cut off, it never attempts to quit it; but there it must inevitably perish.

Such are the changes that this little insect was observed to undergo, after a long course of watching by the most clear-sighted naturalists in Europe. It was long before any distinction of sexes could be observed, and many were the speculations that occurred during this period respecting the mode of its propagation; till at last the cautious Reaumur discovered the male under a form so very different from that of the female above described, that, though it had been often seen, it had not been suspected to be an individual of this species. A knowledge of the way in which he was led to this discovery may serve as a lesson to other observers; it will, therefore, be proper briefly to state it here.

Mr. Reaumur observed, that the larvæ of this insect were often placed so near to each other on the tender twigs of the peach-tree, as nearly to touch each other, even while they were yet of very diminutive size; and he was at a loss to conceive how they could find room upon it when they attained their full magnitude. This made him attend to their progress with more than ordinary care; in consequence of which he soon remarked, that when they had attained their fullest extent of surface, and began to swell upwards, there

were two classes very distinctly perceptible, one of which was greatly inferior in size to the other, and never attained to nearly such an eminence of projection, these small ones becoming stationary at that particular period when the others began to advance to the quickest stage in their progress. At first he thought that these must have been abortive embryos that had been occasioned by some unknown cause; but finding the proportions of these at all times nearly the same, and that in all cases the small were much more numerous than the larger sort, he began to doubt this opinion. Upon opening these galls (for so we may not improperly call them) for examination, he found that they were empty and dry, while those of the larger sort were full and moist. On a still narrower inspection, he found in them some of the exuviae of an insect, which convinced him that these dry cases had performed the office of a cocoon, in which the insect had passed its nymph state, and afterwards escaped when it attained its complete perfection. On searching more narrowly, he found some of the nymphs yet in their dormant state, which afterwards assumed the form of a small active fly, that soon made its escape. Having thus obtained a knowledge of this fly, he watched its progress so narrowly, as soon to obtain the most decisive evidences that it was indeed the male of this species of Coccus, who, after a short but active life, soon closed his existence without having tasted food, being provided with no sort of organs for that purpose.

These flies are very small when compared to the female, not being nearly one fourth part of their size;

but are a beautiful little animal. The head is ornamented with two long antennæ; it has six legs, a pair of globular eyes, one pair of wings, which are proportionally large, being twice the length of the body at least. The abdomen terminates in a long pointed kind of tail; but what more particularly characterises this fly are two long white filaments which spring out from behind, and are twice as long as the wings. As to colours: the head, body, corcelet, and legs of this fly are of a deep red; the wings of a dirty white, less transparent than is common with flies of the common sorts; they are bordered with a stripe of bright red approaching to that of carmine, which proves a great ornament to this little insect.

These flies generally appear towards the end of April. About the beginning of May the female has attained nearly her full convexity; towards the middle of that month her eggs begin to be extruded from the abdomen, and about the end of May the whole of this operation is finished, and the life of the mother brought to a close. Early in June the young fry are hatched; and about the middle of that month the nest is totally abandoned by them. They have now spread themselves about upon the leaves and tenderest twigs that they can find. It is generally about the beginning of April that the females cast their last skin, when it may be supposed that they emerge from their nymph state, after which they swell rapidly till they have attained their fullest degree of prominence.

I have been at the pains to trace the progress and changes of this singular insect thus particularly, not only with a view to satisfy the curiosity of my readers,

26 *On the cause of the Blight on Trees.*

but also to furnish materials for a few observations, tending to lead to the means of lessening the evils that result from the operations of this and some other insects: for it is by observing facts alone, and reasoning upon them, that any good can ever result from this department of science.

There is a disease which every person who has adverted to the progress of trees, particularly fruit trees, must have often heard of, as well as seen the effects that are attributed to it. It is called *blight*; a word so familiar, that people do not seem to give themselves the trouble to inquire what it means. If you ask a gardener What is a blight,—he will tell you it is a something, that every body knows, which affects the health of trees. When you press him to say what is the cause of it, he knows not, only he thinks it comes from some particular affection of the air; and that a common consequence of it is, a shrivelling up of the leaves, very often accompanied with swarms of diminutive insects, or an incrustation of a whitish powder over all the leaves. In short, it is a convenient term among gardeners, like that of *nervous* among physicians, to give an appearance of knowledge respecting those cases of which they know nothing.

Without pretending to say positively, that a particular state of the atmosphere may not produce certain diseases on plants, especially when the changes from heat to cold have been great and sudden, it may with safety be asserted, that, perhaps ninety-nine times out of a hundred, those diseases called *blights* are the consequence of the ravages of insects, and not the cause of it. And were a proper degree of attention to be

given to the transformations and habits of the insects that swarm in our gardens, these blights might be entirely obviated: of this, the history of the insect now under consideration will afford a very satisfactory proof.

Nothing is more common than to see a peach-tree which shows a fair blossom; but before the leaves come out, the points of the twigs appear dark and discoloured; the leaves come out sickly; the blossom falls, or the fruit that sets drops off when it has made a small progress; even the leaves sometimes drop off entirely, and it appears as bare towards the beginning of May as it was at Christmas. This has all been occasioned by a *blight*. It then begins to recover a little, and before the middle of June puts out a fresh set of leaves; it begins to push forth its tender shoots, and assumes a most promising appearance; but by and by a cruel blight, that has been produced by some inauspicious haze, again attacks the ill-fated tree; the effects of which are plainly perceptible by the leaves being all covered over with a whitish powder like hoar frost, in consequence of which severe shock they are arrested in their progress, and never through the whole season recover the effects of it.

Such are the facts, and such the explanation of them that is usually given. The conclusion is, that, as men can have no influence in regulating the changes of the atmosphere, it exceeds our power to ward off the disease; and nothing remains for us to do but to submit contentedly to the will of Heaven. If, however, we take the trouble to ascertain the real facts in this case, we shall be induced to draw a very different inference.

The young shoots at the beginning of the season are sullied by immense crowds of the *coccus* that I have above described, which had been bred on the same tree during the former season, and been suffered to increase without molestation. In consequence of the numerous issues for the sap that are opened by the insects, not only that which goes to sustain them, but that also which (perhaps in greater quantities) falls among the leaves and is dissipated, the tree becomes sickly. As the insects increase in size, and come nearer to maturity, their operations are more powerful, and it becomes almost wholly exhausted; so that the leaves sometimes fall off entirely. No sooner, however, do these insects give over eating, previous to going into their nymph state, than these drains are suffered to dry up, and the plant begins to acquire some vigour. None of the males after this requiring any food, and it being uncertain whether even the females, while in the state of gestation, require any, the sap, now allowed to resume its usual course, produces its natural effect by pushing forth leaves and shoots, which go forward in their course till the young fry are hatched, and have acquired strength to go about in search of food. They now disperse themselves in myriads all over the parent tree where they have been hatched. Nothing can be more suitable for their use than the tender leaves upon it that have so lately been produced there. They fix themselves upon these leaves in multitudes, where they remain immoveable in the form of that powder above described, which upon a near examination is found to be more like to those small scales sometimes generated among the hair of

the human head, than hoar frost. These dead-like insects operate as before, and inevitably render the tree sickly. When the leaves drop, they are suffered to remain at the bottom of the tree until the insects have had time to quit their hold and ascend the tree, and fix themselves upon the young shoots, where they pave the way for a fresh blight, which will inevitably take place upon the same tree the next season; and so on. Thus it happens, that when the blight once affects a particular tree to a considerable degree, it is ten to one but it will be affected with the same disease for many successive years, as every one knows is the case; and it can be only owing to some accidental circumstance if ever this disease is got rid of. Such are the consequences of that prepossession which blinds the understanding, and unnerves the hand of industry. Shall man remain for ever under the influence of this fascinating power? If I endeavour to arouse attention in such a case, the attempt surely ought to be received with indulgence.

The eradication of this insect, from a careful attention to the facts above stated respecting its transformations and habits, appears to be a far less difficult task than many of those in which man has happily succeeded. In the first place, if the twigs were carefully brushed early in the spring with a hard brush in the direction of the buds, many of them might be detached, and thus their numbers would be greatly reduced. Where the insects are very numerous, and where, of course, they are placed very close together at the points of the twigs, these points might be cut off, and carried out of the garden; for it is by no

30 *Peach Trees may be preserved from the Coccus.*

means certain, that these creatures have as yet lost their locomotive power; so that if the twigs be thrown at the bottom of the stem, they may re-ascend it. Where the insects are exceedingly numerous, all the young twigs even might be cut out, especially if Mr. Forsyth's plaster be applied to tip the wounds. In this case, it is true, the fruit will be in a great measure lost for that season; but the tree will be thrown into such high health, as to be in the finest order the next year. After all this has been done, however, the tree ought still to be examined with the strictest attention towards the end of April and beginning of May next season; by which time the female coccus, having attained to its greatest height, will become easily perceptible, when each of them should be carefully detached from the branch to which it adheres, by means of a blunt knife having a very thin blade, and carefully deposited in a vessel for being carried out of the garden. About three thousand eggs will be destroyed for each of these gall-like insects that is thus cut out; so that great progress may be made in a very little time. The empty exuviae of the males, which are now readily distinguishable, may be neglected; and as none of either sex are to be found on the shoots of that season, it is unnecessary now to examine them, so that the labour is thus greatly abridged.

If this process shall be performed with care, very few will be suffered to escape: and it is of so much consequence that it be done with care, that no person ought ever to grudge the trouble; for I cannot too often repeat it, that as every insect is produced from seed, if these seeds be fairly eradicated, all future trou-

ble respecting that insect will be entirely obviated; that is, if it be not a winged insect, or one that can otherwise transport itself easily from elsewhere. It happens fortunately in this case, that the coccus cannot be transported from any considerable distance; so that one radical and thorough cleaning will prevent the necessity of repeating it; whereas a partial thinning of them will only give occasion for unceasing labour during every successive year. Considered under this point of view, it were better to eradicate the trees entirely, as many persons at present find it necessary to do in order to get rid of this disease where it has been once firmly established, than to attempt to remove it by these careless and slovenly palliatives; but this eradication is what I would by no means advise; for, besides the purchase price of the trees, which would do much more than pay the expence of cleaning every twig of the tree one by one in the most careful manner, it is well known, that many years must elapse before a young tree can be brought to bear half so much fruit as an old tree (under proper management) might be made to produce the first year after this sort of cleansing. I myself tried what could be done last year by cutting off the vine *coccus* that I found had taken possession of my trees in the house; and though it was past the proper time to begin before I had thought of it, as some of the young had been hatched, and thus made their escape, yet I find that I have not this season one for perhaps a hundred that I had last year.

Nor is the above the only practicable way of getting rid of this destructive *blight*. Should the insects have

been neglected even till the young are hatched, and have fixed themselves to the leaves, appearing there in great numbers in their scaly state, it may still be effected. In that case, these leaves ought not to be suffered to fall off of themselves, but they should be all carefully plucked off and put into baskets to be carried off the ground. Perhaps the best time for this operation might be as soon as these insects make their appearance upon the leaves; for the tree would soon push out new leaves at that season; but if there be any fruit upon the trees, that operation should be deferred till the fruit be gathered, and then no time should be lost to strip off all the leaves, and brush the young twigs, if any insects shall appear upon them. In this way so few will escape, as to make it an easy matter perfectly to extirpate the remainder by cutting off the females in the spring. By pulling off the leaves at this season too, the vegetation is checked; the points of the young shoots gradually harden before the severe cold of winter approaches; and thus they are the better enabled to resist the severity of frost than they otherwise would have been. I have thus, for the sake of experiment, hardened several trees, which, by continuing to shoot late in the season, are apt to have the points of their wings so herbaceous as to be cut down by the mildest winters we ever have, but which, by being thus prepared, have stood our hardest winters without losing a twig. The practice of plucking off the leaves at this season (early in autumn), therefore, is in other respects beneficial, besides that for which it is here recommended, and ought not to be neglected when there seems to be the slightest reason for it. The fig-tree might probably be thus hardened, so

as to run no risk of being killed by a severe winter.

If I should be so fortunate as to induce my readers once to be satisfied, that it is not an impossible task to eradicate vermin that are destructive to man, they would soon discover various means of exercising their ingenuity with effect, as soon as they had acquired a competent knowledge of the objects that annoy them. It is, in fact, a much easier task than most persons are aware of: nor is it easy to calculate how much benefit will be in this respect derived from cleanliness and attention alone. There is an insect belonging to this class, which has multiplied extremely in the nurseries about this metropolis, and which, unless guarded against, threatens to be extremely destructive to our orchards every where. It lives upon the apple-trees, and, like most of the insects of this kind, throws out such a quantity of cotton-like matter, as sometimes to cover every twig of the young trees as if they had been rolled in cotton, or the down adhering to the willow seeds. The history of this insect is still involved in obscurity; and I believe the changes it undergoes, their periods, and its modes of life during the various stages of its existence, are not distinctly known. Till these be ascertained, however, the most efficacious method of eradicating it cannot be pointed out: and here opens a fine field for the application of genius and industry, which I warmly recommend to such of my young readers as are ambitious of being honourably distinguished among their compatriots. Till this shall be done, I must content myself with premising a few circumstances respecting it, that are not so generally known as they ought to be.

Wherever this insect has nestled upon a tree, it communicates a corrosive ichor that affects the tree after the insect itself is removed, like a kind of gangreen; so that the tree becomes blotched, uneven in the bark, and full of deep holes that soon produce its decay and death. The insect fastens itself, by preference, upon the tender buds of young trees, immediately under the axillæ of the leaves on the shoots of that year, and very quickly infects them. This insect, however, takes such slight hold, that if it has not had time to bury itself in holes in the bark, it may be easily brushed off by means of a firm dry painter's brush; so that the shoot shall sustain no damage for it. Rain also washes it off from smooth surfaces; and a wet brush may, during moist weather, be efficaciously employed for the same purpose.

Next to the eyes on the young shoot, this insect is found to establish itself in any cavities in the stems or larger branches of trees, which have been produced by tearing off branches incautiously, or any other wound in the bark. In these irregular cavities it finds a protection from rain; and thence, when they are once established, it is difficult to dislodge them by a brush or other mechanical means; so that these cavities may be considered as the nests from which they send out swarms to spread over the young branches when the weather is favourable to them. One great preventive then would be, to scoop out all these cavities to the quick; to cut off all irregular prominences; to scrape off the loose scales from the bark, and then to cover it with Mr. Forsyth's composition, which would not only defend it in the mean time from the operation of these insects, but, by bringing on a smooth clean bark,

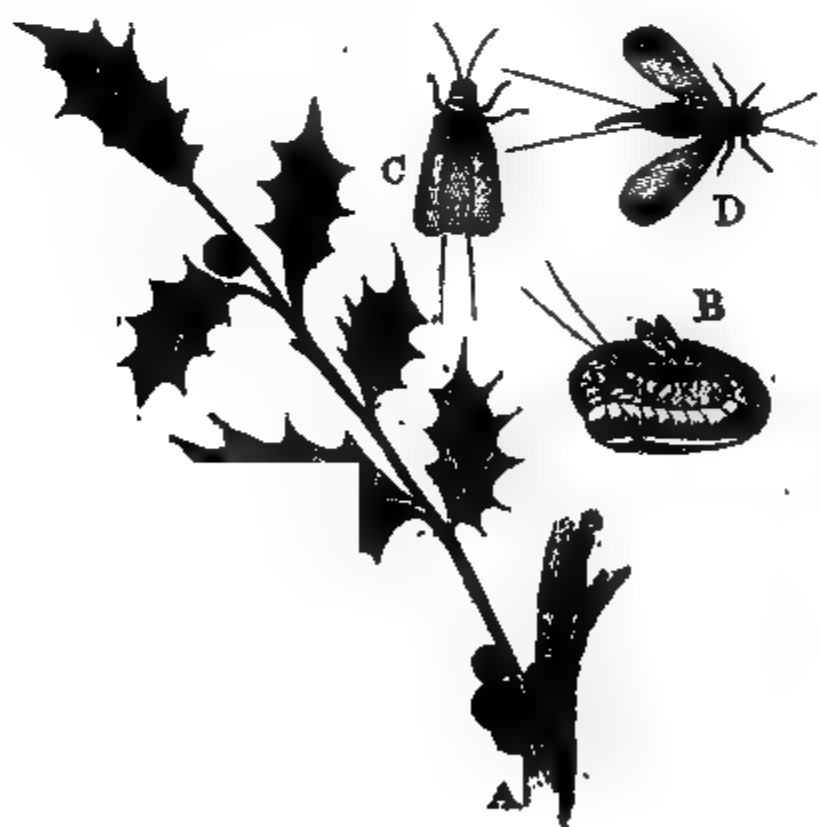
would admit of its being washed and cleaned afterwards without difficulty, which would preserve it alike from these insects and many others which find shelter in the inequalities of a rough bark, and give the tree at the same time additional health and vigour.

The above would be the most efficacious mode of proceeding; but those who are too indolent to take this trouble may be benefited by that composition in another way. If a wet mop made of shreads of any sort, or pieces of mat tied up, be dipped in this composition when in a proper degree of fluidity, and then dashed repeatedly upon these irregular cavities where the insect is discovered, varying the direction of the strokes as much as possible; the composition is then thrown into every crevice, to which, on account of its cohesiveness, it adheres, so as to envelope the whole insect with a thick coating which, excluding the air, soon makes it perish, and there effectually entombs it. This I have found an easy and efficacious application for exterminating this insect in these its otherwise inaccessible retreats. All other insects will probably be suffocated for want of air when thus covered. The whole tree, if thus daubed over, would be effectually defended from them for a long time; but in order to cover the small twigs, two mops would be necessary, which, by being struck against each other with the twig between them, would soon cover it all over. This application, while it kills the insects upon the tree at the time, and guards it against their attacks for a long while after, does not hurt the tree itself. I have found that the aphids also is effectually killed by the same application; and that the leaves and twigs of trees

36 *Figure of the Ilex Cocci Glandiferi.*

may be much more easily freed from that insect by means of a brush, than I could have imagined; so that by a little attention and industry they may be in most cases effectually removed.

To give the reader some notion of the form and general appearance of this singular class of insects, I have given at the end of this article a figure (A) of a branch of the dwarf evergreen oak, common in the South of France and Spain, called *ilex cocci glandifera*, chiefly remarkable for its being the only plant on which is produced the long famed drug called *kermes*, with some of the insects adhering to it, in the manner they are usually placed, assuming the appearance of a red globular berry. B. represents a magnified figure of the common peach coccus, male and female, of a proportionate size. C and D represent the male fly in different positions greatly magnified; all copied from Reaumur.



MISCELLANEOUS LITERATURE.

To the Editor of Recreations in Agriculture, &c.

SIR,

THE general train of your writings so perfectly accord with the frame of my mind, that I suffer none of them to pass without a careful perusal. Your correspondence with Mr. Washington afforded me a very particular degree of satisfaction; not only because it exhibits the character of that great man in a most amiable point of view, but also, because you have there entered upon the consideration of a subject that has long attracted my particular attention, without my having derived satisfactory information from any of those discussions concerning it that have fallen in my way. I mean political economy; or, that science, which has for its object those legislative regulations which may tend in the highest degree to promote domestic comforts and national tranquillity. I will not deny, that in perusing these letters I found several doubts which used to perplex me entirely removed; and the objects in general placed in a light wherein I had not been accustomed to view them, and which led, on some occasions, to conclusions that I was not prepared to expect. On these accounts I was much gratified at observing a hint in one place, which seemed to indicate that it was your intention soon to resume the subject in this work. I looked forward to the fulfilment of that promise with pleasure, nor felt any uneasy solicitude concerning it till I read the concluding address in your last Number, which made me

28 *On the Political Effects of Manufactures.*

apprehensive that the chagrins you have met with might induce you to relinquish your intention respecting that particular, and several others, from a doubt that you might not get them all finished within the limits which you seemed to have prescribed to yourself. Permit me to express a hope, that the cause of those chagrins will be removed, and that you will be allowed to gratify the wishes of your numerous readers by proceeding in your career with renovated vigour. In the mean while, I beg leave to offer a few suggestions with a view to induce discussion.

I am a native of one of the northern counties, in which manufactures have made rapid advances during the last twenty years, to the detriment, as I think, of agriculture; and, I am afraid, to the prejudice of the happiness and domestic comforts of the people also; though I scarcely dare hint at this in my native district: for the people have universally now more money to spend than they used to have; they are, therefore, of course, reckoned more easy in their circumstances, and more happy; for wealth and happiness are now deemed nearly synonymous terms. For my own part, I do not view them in that light: and if I did, I would make a great distinction between having much money to spend, and being wealthy; for one man may have ten thousand pounds a year to spend, yet be very poor; and another may be "passing rich" who has not a hundred to expend. Taking things in this point of view, I sincerely believe, that our grandfathers were more wealthy than we are, because they had fewer wants unsatisfied. Pursuing this train of reasoning, I sincerely wish that you, sir, would

turn your attention to this subject, and try to put your fellow citizens upon their guard against going so generally into the present rage for trade and manufactures in preference to agriculture; and point out to them the pernicious tendency of too ardent a pursuit after riches, and those sensual gratifications to which they so naturally pave the way.

Every judicious person will readily admit the utility of calling forth the industry of the country; but the danger seems to arise from the giving that industry too much of one direction. Manufactures, when they first spring up, assume a pleasing and a smiling appearance; but as they advance, they collect together the profligate, the daring, and the licentious; till at length they present to the more innocent spectators a spectacle hideous, alarming, and dangerous. Perhaps the happiest era of any civilised country is, when its industry is judiciously distributed among the labourers, artizans, merchants, and other classes useful to society; and when no circumstances are allowed so to operate, as to induce an undue preference to be given to any one profession, more than what the accommodation of men in social life naturally call for; and when such attention is paid to merit, that the surest means of attaining honour and respectability in life requires a strict attention to those studies and pursuits which tend to elevate the mind, and add dignity to human nature. Such is certainly not the case in this country at present, where wealth is considered as alone sufficient to entitle any man to grasp at the highest honours: and this I consider as a necessary consequence of that bias to manufacture and speculative

40 *Political Effects of Trade and Manufactures.*

adventure which forms such a striking characteristic of the present times.

It has been admitted, however, by the most sensible men in all ages, that a proper education may be considered as the source of the greatest benefits to society as well as individuals, seeing that the earliest impressions determine the character of man, and operate with good or bad effect the rest of his life: accordingly we find, that among those nations of antiquity to which we look up with admiration, education was deemed a business of the most serious concern, that could only be completed at an advanced period of life. Whatever, therefore, operates so as to shorten too much that necessary and useful period of time that is spent in acquiring virtuous instruction, or has a tendency to corrupt the sources of education itself, is certainly in the most alarming degree hostile to the interests and happiness of mankind. But a much extended manufacture, by giving too early employments to children of both sexes, of the middling, as well as the common rank of life, takes them too soon, or altogether from school, where they not only acquired necessary information, but likewise habits of order and subordination, which they naturally carried into the world with them, formerly with good effects to themselves and society.

Not only are young minds thus prevented from acquiring competent notions of moral rectitude, and a steadiness in the conduct which that would naturally suggest, but their principles are even positively perverted. No one will deny, that the present state of manufactures has a certain tendency to corrupt the

Political Effects of Trade and Manufactures. 41

young mind. The first objects that present themselves to the growing passions, are fortune and splendour; and young people, seeing that these objects obtain the incense and homage of all around them, they naturally come to consider these as alone deserving their attention; so that the moral virtues are seldom adverted to or deemed of importance enough to be allowed to bar the way to the great object of all their wishes—money.

The more manufactures extend themselves, the more do they throw society into an unnatural state, when considered under a variety of points of view. By collecting many persons together into large bodies, they give rise to an infinity of evils. As ingenuity or dexterity in some particular department is a much stronger recommendation into that community than purity of morals, or rectitude of mind, these last are seldom inquired into when one solicits for admittance among them: hence the worthless are mixed with the young of both sexes, who, not having had their minds steadied by the principles of a well regulated education, become an easy prey to the contagion of bad example; so that the vicious infection of wickedness and debauchery quickly infects the whole body.

In every situation these evils are experienced in a lesser or greater degree; but it becomes particularly destructive since the late introduction of machinery so universally in manufactures; which, by admitting the operations of children, collect together great bodies of infants, as they may be called, without any proper checks upon their conduct; so that the whole body of the lower orders of the people are thus involved in one

indiscriminate mass of debauchery and corruption, before they have scarcely had an idea of what a state of innocence is. The future consequences of this species of corruption, in annihilating the comforts of domestic life, it would not be an easy task fully to develop; but the slightest glance at it makes the mind shudder with horror.

Manufactures, it is true, by the great diffusion of money that they occasion, bring forward in the community a great number of *rich* individuals; but it is to be regretted, that bad and mean men increase thus in riches as fast as good men. With such persons, riches will be too often employed for the purposes of seduction, gross gratification, and frivolous amusements; for the uninformed mind has no source of gratification but in the indulgence of the senses alone; and we have seen, that, in consequence of a generally neglected education, and that lax state of morals which results from the combinations above hinted at, they will find a field but too readily prepared for them to indulge in every vice. The more money there is diffused, the more the passions are indulged, and the more furious they grow, till at last a certain foundation is laid for general misery and wretchedness, by the sure introduction of vice under every form—profligacy, drunkenness, debility, and disease.

It is not my intention to enter fully into the investigation of this subject under other points of view. This I would humbly solicit from your own pen. I have confined myself merely to those circumstances which have fallen under my own notice; chiefly of a moral tendency. As to their political tendency, as

these circumstances shall affect the population and public tranquillity of the state, but above all the production of corn and the subsistence of the people (which I have no doubt are deeply affected by them), I pretend not to estimate them: hoping that a subject of so much national importance, now and at all times, will not be suffered to escape your notice: and I shall think my pains in writing this letter abundantly repaid, if it shall have a tendency to produce that effect. I remain, with the most respectful esteem, sir, your constant reader and sincere well-wisher,

A COUNTRY PARSON,

*Who has no expectation of ever enjoying the luxury
of lawn sleeves.*

To the Editor of Recreations in Agriculture, &c.

SIR,

September 4th, 1800.

I was much concerned, on reading the latter part of your last Number, to observe the trouble that you have experienced in the course of the publication of the third volume of your Recreations: I hope, however, that it has not been such as to induce you to decline the further prosecution of the work, as by that means I should, in common with your other numerous readers, be a very considerable loser, from the pleasure I receive in the perusal of your periodical numbers. I admire, and wish you success in, the Entomological department; and, though from my present situation and occupations I have little leisure or opportunity to turn my attention to subjects of that

nature, yet I hope and trust that your exhortations will raise in the minds of your country readers a desire to obtain information in a science which so eminently combines instruction and pleasure, and in the study of which the admirable dispositions of Providence are so much more perfectly shewn than in the eruption of volcanos or the revolutions of kingdoms.

The inducements to this study are so numerous, and at the same time so obvious, that it is needless here to dwell upon them. The novelty of the subject is in itself sufficient to ensure a lasting reputation to him who shall pay a proper attention to it; and I can conceive no other reason, why none of our countrymen have yet attained any great degree of eminence in this science, than the constant attention it requires, and the unceasing exercise of that homely, but highly useful virtue, patience, which the inhabitants of this island are not very famous for possessing or exerting. The habits and propensities of these little creatures have been so entirely neglected, and their distinctive qualities are so little known, that every step appears to be fairy ground; and the further we proceed, the more our admiration increases. The road is so full of flowers blooming and sweet-scented at the rose of the mountain, that the few thorns which now and then stretch across are beheld almost with pleasure, as a variety in which the human mind delights, and only operate as fresh incitements to diligence and perseverance. In the formation of the minute animalculæ, we see the unity and perfection of the designs of Providence; we there see plainly manifested the existence of a deity, all-pervading! whose influence extends from

the mighty lion of the forest, to the meanest reptile that crawls upon the face of the earth. Let the Atheist observe these things with the attention that they deserve, and, though he may "laugh at the tempest, and deride the storm," as the production of natural causes without the intervention of superior power, yet let him then, if he dare, with an unblushing front, proudly and contemptuously deny the work of an Almighty creator. The evidences that will be thus displayed to him will, I apprehend, make his favourite doctrine of chance fall with disgrace to the ground.

The study of Entomology as a science (not for the sake of nomenclature only) seems to me to be one of the most useful as well as most engaging of any that have yet been discovered. The calm delight and pleasing sensations which are caused in the progress of this study, and the animation and pride which are felt on making any new discovery, sufficiently compensate the trouble and fatigue attending the necessary experiments; and it is wonderful to me, that mankind should so long have sought in the bustle of war and in the pomp of courts, for that happiness and distinction which was so easily attainable without the dread of either danger or disgrace.

Although I have written thus far, the chief purpose of this letter is to express to you my complete satisfaction with the manner in which you have acted from the commencement of your work, and the regret that I shall feel, if any cause, of whatever nature, shall make it necessary for you either wholly to decline or to postpone the continuance of it; and though I have

sometimes felt the want of engravings for the illustration of particular subjects, I am now perfectly convinced that they would have been given if possible. Accept, sir, the sincere good wishes of one who, although an entire stranger to you personally, is an admirer of your abilities, and of the manner in which they are exercised; and begs leave to subscribe himself, with great respect and esteem, your most humble servant,

S. H.

P. S. I beg leave to mention, for the consideration of your correspondent Entomophilus, a letter which appeared in "The Monthly Magazine" for August last, stating an instance of a person suffering extremely from an earwig penetrating into his ear; and which, if true, so plainly contradicts the assertion, in your correspondent's account, of the harmlessness of that insect.

To the Editor of Recreations in Agriculture, &c.

SIR,

May 19, 1800.

I SEND you my ideas on the cause of the difference between evergreen and deciduous trees, in hopes that, though not conclusive in themselves, they might however give rise to some more so in the minds of others, if they should be thought worth insertion.

The original and principal cause of the difference between evergreens and deciduous trees has by some been attributed to oxygen, and others to a peculiar kind of varnish, which preserves the leaves from the

injurious effects they might experience from the severity and the variations of the weather.

Lately, however, I have been tempted to ascribe it to the all-powerful effects of *caloric*. It is well known that cold, where it is not sufficient to condense, diminishes the fluidity of liquids in a greater or lesser proportion, according to the degree of cold required to condense the different fluids; in the same manner, from there being a greater quantity of juices [some of the component parts of the sap may be different in deciduous and evergreen trees—experiments might decide] from the larger size of the vessels through which they pass, and from the thickness of the leaves and strength of the cuticle being greater in evergreens than in deciduous trees, the former follow the great law which nature has laid down only so far as being *thickened*, but not sufficiently to stop the circulation entirely, which therefore continues *slowly* through the colder months of the year, and thereby the leaves are preserved through the winter. In frosty or very cold weather we may observe that evergreens look drooping, which I suppose may arise from the cold being in too large a proportion for the quantity of caloric contained in the tree; evergreens are indeed sometimes killed by severe weather.

Perhaps trees may be hurt by the March winds, from too great an expension of caloric being occasioned by them, and a sufficient quantity not being left to support the health and vigour of the leaves. The caloric which is expired by evergreens may in some measure ameliorate the harshness of the air, and help to preserve the temperature necessary for exist-

ence. This latter idea was suggested by the observation, that in colder climates, where there is scarcely verdure, and no inhabitants, so there are no trees to lend their assistance towards softening the atmosphere. Evergreens appear in a peculiar degree to be natives of northern [polar] climates, as I rather imagine them to be importations from countries where the winters are still more severe than in England.

I should be happy to have my sentiments on this subject either elucidated or rectified, and I remain, in the hope of farther information, your admirer and constant reader,

B. C.

As the Editor has at all times a pleasure in obliging those who show an inclination to engage in useful researches, the above has been inserted, though to some it may appear objectionable, on account of the loose manner in which it is written, and the total want of facts to support the hypothesis; but the shortness of it may be pleaded in excuse for its insertion.

The writer seems to have forgotten that this miscellany is not calculated for readers in general who are far advanced in the technical knowledge of physics. It is chiefly meant to give general notions on subjects of this nature when they occur, to such as have not previously entered deeply into these researches: of course, it will be expected that when terms purely technical occur, such as *oxygen*, *caloric*, &c. that somewhat like a popular explanation of what is meant by these terms should be given, otherwise they can convey no sort of ideas to such readers. Indeed, I am of opinion that it would be an excellent praxis for

young writers when they employ such terms, always to accustom themselves to think what answer they would be able to give to a person of sound understanding, though not technically learned, should he bluntly ask the precise idea annexed to such terms. I am induced to think thus, from having observed the happy effects of a practice of this sort, in regard to common words, that was introduced by a friend of mine in educating a young family, who made it a practice to desire his children to define with some degree of precision such words as they employed, which he selected for that purpose; the consequence of this was, that, although at the beginning they found great difficulty in giving the precise idea conveyed by any word; yet in consequence of the deficiencies of such definitions being pointed out, and the corrections suggested by each other, they came at length to have a much more comprehensive idea of the beauties and defects of language, and expressed themselves with more neatness and precision than ever they could have otherwise done. Such of my young readers as shall try this among themselves will be astonished at the vague ideas they have annexed to many words, and the inaccurate manner in which they are accustomed to employ them: nor am I free from suspicion, that were our chemical philosophers thus to tie themselves down to the invariable practice of never using such words as oxygen, hydrogen, nitrogen, caloric, azote, &c. unless when they respectively served to denote a clear idea that they could accurately explain if required, these words would be used more sparingly than they now are. I say no more on that head at present.

The human mind does not seem to have a more decided propensity to any one thing than that of wishing to explain the causes of all the phenomena of nature. This propensity has, no doubt, been implanted for wise purposes; but, like all others, it is liable to abuse. When philosophers (which is unfortunately too common a case among men of weak minds who are ambitious of that name), leave out of their system the superintending influence of the OMNIPOTENT WILL, they are every moment reduced to shifts to help them out, that tend very much to degrade them in the scale of reasoning beings. The puzzling case respecting the existence of *mind*, and the manner in which it operates upon *matter* is perpetually in their way; and many other difficulties, though less obscure, frequently present themselves, which are only to be got rid of by the soothing kind of reasoning that, like the cuttle fish, conceals its weakness under the obscurity it produces. That it was the SUPREME WILL that different climates on this globe should have plants and animals suited to each, there can be no doubt; and for that purpose we observe certain plants and animals have been so formed as to live some of them in one region or one medium only, and some in another. Some live in air alone, others in water only; some can only exist in hot regions, while others perish if they are not kept perpetually cool. On some occasions we can observe that a different set of organs are usually employed for one purpose, and others for another; such as gills for fishes, and lungs for land animals: but why these organs were made necessary for these purposes, can only be resolvable into the will of Heaven;

for no person will presume to say that if it had pleased heaven these organs might have been entirely dispensed with; or interchanged, and the animal functions have been still performed. All that we can do, then, is to observe nature as it becomes cognisable by our senses, and to reason upon the facts we thus obtain. To do more far exceeds the utmost stretch of our limited powers.

From a careful observation of facts we are enabled to perceive that the whole order of the Simia, or ape kind (man excepted) and many other animals, have their organs so constructed as to be unable to endure a very moderate degree of cold; and are inevitably deprived of life when subjected to a temperature that would not prove in the smallest degree injurious to a dog, a horse, a bullock, sheep, or the other domestic animals common with us; though these would, in their turn, be killed if exposed to a degree of cold that proves only genial to the Antarctic bear: but why this last should feel as high a degree of enjoyment when resting on a piece of ice, and under a degree of cold that would quickly congeal the blood in the veins of man himself, as a dog does while basking on the hearth before a blazing fire; we know no more than why certain fishes delight in the coldest water, while others are only to be found in it when nearly at the boiling point.

We observe also that some creatures which seem to delight in the same temperature with that which is the most friendly to the human frame, are nevertheless endowed with qualities extremely different from those that man possesses. It is observed that the mere bulk

of an animal body tends greatly to enable it to resist the effects of cold, and that the circulation is first stopped in the smallest members. The fingers, and toes, and noses of men are often frost bitten, and drop off after being wholly deprived of life long before the body be affected by it. Thus, were a man to grasp with his naked hand the frozen branch of a tree in one of those winter evenings which are common in this island, his fingers would be in a short time benumbed, and soon would be entirely killed; while a tom-tit, whose whole body does not much exceed the size of one of our fingers, shall sit the night long perched upon one of those frozen branches, firmly grasped by its naked toes, not thicker than a pack-thread, without sustaining the smallest injury; yet the blood that circulates in the veins of a bird and in those of a man, are not extremely dissimilar upon such analysis as we can make of them. And were they different even, what but the will of the supreme Being had ordained that it should be so? That their qualities are very different we see; but the cause of that difference we know not.

It is a law of nature pretty universal that the insect tribe, whose wings are so delicately formed as to be little calculated, one would think, to resist the extremes of heat and cold; they are, of course, easily killed in either of these extremes; yet the house cricket, which appears to our senses to be equally delicately formed with most others, can only live in a degree of heat which would roast, and entirely consume many other insects of a similar construction. What reason can be assigned but the Almighty fiat that it should be so?

If we resort to facts to observe how far they correspond with the hypothesis respecting evergreen plants above thrown out, if I understand it rightly, it would seem to be a natural inference that evergreen plants are more capable of resisting cold than others; if so, they ought in the first place to be more appropriated to polar than tropical regions; and secondly, evergreens ought to be found in more rigorous climates than any deciduous vegetables. How do facts stand? Our green-houses we find filled with a vast variety of evergreen plants, so that it appears to me pretty evident that a greater proportion of the plants which are natives of tropical regions are evergreens than those of polar regions. Some of these are so impatient of cold as scarcely to be kept alive but in the heat of a stove. Even the pine-apple itself is an ever-green. Indeed I know few evergreens, unless it be some of those of the pine tribe, the Junipers and Rhododendrons, that can resist the cold of polar regions. The myrtle cannot resist the winter cold of Britain. The sweet-bay but barely bears it. The Portugal laurel resists our greatest cold, but cannot bear the rigours of a Siberian winter, where the Rhododendron prospers. The common furze (*Ulex Europæus*) though so common with us, is not known about St. Petersburg. In short, the hardy pine itself disappears in those regions where the dwarf birch (*Betula nana*) a deciduous tree, is found to prosper.

There seems to be no general rule then respecting the hardiness of evergreens; nor any particular that we can fix upon, *a priori*, which should indicate that they would be hardy, or the reverse, more than re-

specting deciduous trees. The gooseberry is infallibly killed in Rufsia, as well as the apple, and our other common fruit trees, unless they be carefully covered over with straw ropes, and buried deep among the snow; while the currant, so nearly allied to the gooseberry in its botanical characters, resists their most rigorous winters without ever losing a twig. I fear we shall long search in vain for the physical causes of these striking peculiarities. It is a less difficult research, and at the same time more useful, to make ourselves fully acquainted with the facts, and the practical uses that may be derived from them.

To the Editor of Recreations in Agriculture, &c.

FIRST REPORT OF THE SOCIETY FOR BETTERING THE CONDITION, AND INCREASING THE COMFORTS OF—*THE RICH.*

SIR,

AT the close of the eighteenth century, at such a brilliant period of philanthropy (*blazing* throughout Europe) I am very much surprised that one class of unhappy sufferers have escaped the notice of the children of humanity. There are many charitable institutions for the relief of the *poor*; but it is astonishing that there are none for the relief of the *rich*. Considering, therefore, the deplorable condition of many of this class, and their total want of assistance, some charitably disposed persons, among whom I am proud to rank myself, have entered into an association to be called “The Society for Bettering the Condition, and Increasing the Comforts of the Rich.” They have

done me the honour to appoint me their secretary, and in discharge of this important trust, I think it my duty to submit their laudable plan to the public, that, by the assistance of the humane, we may be enabled to extend our relief to all the pitiable objects of our charity. This, I think, is most effectually to be done through the respectable and popular medium of your publication, which, by reflecting its own character on our institution, will give it consequence, and procure it encouragement.

I am afraid the world in general, sir, are not aware of the sufferings of the rich,—that they think their situation more to be envied than pitied; it will therefore be proper in the first place to give an account of their calamitous situation; an account which I am sure will excite the compassion of my readers. But lest my ardent humanity should be mistaken for hypocrisy, and I should be supposed to be soliciting in my own cause, I take this opportunity of declaring upon my honour, that I cannot urge the smallest claim upon the beneficence of this society; I am a poor man, and by that circumstance alone am freed from those numerous distresses under which the objects for whose relief this society was instituted so heavily labour; and I hope, sir, that you and the world will believe me when I say, that I have not a single foot of land on the face of the earth, nor ten pounds of stock, nor a share in any trade, nor any possession, nor any other less ostensible source of riches, such as a handsome wife, or good luck at hazard,—a wealthy *chere-amie*, or a bad conscience,—horses at Newmarket, or informations in the King's Bench; a seat in parliament, or a call to preach in a hypocritical meeting-house,

&c. &c. I have not even a stock of modest assurance; my whole estate may be inclosed not only like queen Dido's in an ox's hide, but in a cotton night-cap; and if you, sir, or the public knew me, you would allow that it was but a poor one.

To return, however, to my subject. Upon diligent inquiry, our committee have found that one of the greatest of the distresses of the rich is—*the want of money*. I am aware that this will at first appear extraordinary, perhaps to some incredible. But, sir, the days of prejudice are passed; and for the truth of this observation, I need only appeal to daily experience. In company, Who do we hear complain most of the high price of provisions? Why, the sober old gentlewoman of fortune, who, accustomed to the comforts of an ancient carriage with fat coach horses, a good table, and a rubber of whist, dreads ruin because she cannot lay by so much as formerly for a spendthrift heir. Who are they that bawl most against taxes, and cry the nation is ruined? Why, some certain members of the house of commons, and certain lords of the land, possessed of thousands a year, who, from the increase of taxes, &c. find they cannot conveniently risk so much as formerly at the pharo-table, cannot keep their chere-amies in so high a style, or cannot run so many horses at Newmarket. Who are they that, to oblige their creditors, or, to speak plainly, *for want of money* to spare from pleasure, and from debts of honour to pay debts of honesty, take lodgings in the King's Bench? Why, the rich, if we may judge from the *necessary comforts* they enjoy, even in confinement, from their wines carefully iced, their fine lodgings within the rules, their curricles and their

hunters both for themselves and their attendant state of a bailiff, disguised in a magnificent livery, or not disguised with a plain frock and cropt head, like a groom or a man of fashion, and their other appurtenances. Who are they that in the city cry, "Money is scarce, Bonaparte has cut the Emperor's throat, and he will soon be here to rob us of the little cash we have?" Why, the rich Jew, or the rich Jew-Christian, who wants to buy two hundred thousand pounds *light-horse*, and only regrets in the distresses of his country that he has *not got more money* to make a bolder push before the stocks get up again. Who is it that borrows of this rich Jew at exorbitant interest? The wealthy man of pleasure, who, born to affluence, has always been in want, and who, to support for the present hour his horses, carriages, and houses, his girl, his son's girls, and his wife's pharo-table; in short, *just to get on* in the easy style required by his condition, ruins his fortune as fast as his son ruins his health, and his wife her honour. In short, was not the wealthy Elwes always in want of money? And Daniel Dancer, though possessed of enough to keep a German prince almost as well as an English citizen, did he not from *prudential* motives, and the want of money, live with no better an establishment than the poorest inhabitant of St. Giles's, and die from want and inanition?

Of this I need not, I think, urge any more instances; I shall therefore proceed to another of the distresses of the rich of the most pitiable nature. This is a certain disease, which, however baneful in its effects, and frequently obscure in its origin, has been, to the great misfortune of this set of patients, hitherto

entirely neglected by physicians. The first symptoms of this distemper are unusual gravity, a certain stiffness in the joints, particularly in the vertebræ of the back bone, and absence of mind. By degrees the unhappy patient becomes morose and ill-tempered, except to a few persons, perhaps still more infected than himself with the same disease. If a man, he is afflicted with a continual stiff neck; if a woman, with a certain volatile action of the spirits in the brain that keeps the head and neck continually tossing. In *both* sexes the face becomes distorted, the nostrils and upper lip drawn up, the lower thrown out, and the eyebrows knit. (What a misfortune, this, for the pretty mouth and arched eyebrow of a female patient, more detrimental to her beauty than the seams of the worst species of small pox!) The memory also, as in many other diseases which like this affect the brain, is soon impaired; so much so, that in many instances persons labouring under this malady (particularly those who from *newly* acquired wealth are more subject to the infection), have been known utterly to forget their oldest friends, &c.; their eyes become so short-sighted, that they frequently do not see their nearest relations when they meet them, particularly in public places (which, I suppose, with all deference to the faculty, is owing to their eyes being dazzled with the unusual *brilliancy of their situation*), and especially if those relations, not being rich, are themselves uninfected. This disease with some has gained such a height that they are obliged to have recourse to glasses to assist their injured eyes; though frequently I have observed that such persons derive no benefit whatever from the use of them; for I have often remarked that when they

looked at a person, even through their glafs, though he was an old friend and intimate companion in the days of their sanity, they have been utterly unable to distinguish his features sufficiently to recognise him. This last alarming case has so often occurred of late, that an eminent oculist of my acquaintance thinks it may ultimately produce *ophthalmia*. The sight is not only weakened, but it also becomes strangely erroneous, by reason of which those afflicted with this distemper are apt to think others shorter and less consequential than they really are, and themselves much taller. Indeed I have known some, though themselves as diminutive in stature as a Jew, be so utterly deceived by this defect in their optics, as to strain their poor necks, and make great efforts, standing on tiptoe, in order to overlook others really much greater than they were, and even fancy that they succeeded; or, if imprudently undeceived by some plain-speaking person, they would be extremely angry, and affirm that the tall man behaved very ill, stood on a stool or a chair, or got on some *great man's back*. The vulgar call this instance of the disease in question, *holding the head high*.

What particularly makes me earnest to alleviate the ravages of this disease is, that many beautiful and otherwise amiable young ladies have lost the best matches, and have died in the melancholy situation of what are called old maids, solely from being afflicted with this loathsome distemper. While others, who have been notwithstanding fortunate enough to marry, have destroyed their connubial happiness with absurdly disputing with their husbands which was the tallest.

From these last symptoms of the disease, sir, I suspect that it must be seated in the brain, or, to speak plainly, be a species of insanity: a melancholy opinion, but I fear too well founded. Now, sir, let me appeal to the humanity of your readers, whether the victims of this melancholy affliction on human nature, which deprives the unhappy patient of all the charms of conversation by rendering him absent and morose; which impairs the memory of the brightest understandings, which so frequently spoils the finest features of the most beautiful women, and which entirely vitiates the sight of the most brilliant eye, be not greater objects of charitable relief than the sufferers under the gout, rheumatism, jail distemper, or other less virulent and less disgusting diseases? What greatly adds to the calamity is, that it does not appear to shorten life in the smallest degree; nor have I ever known an instance of a radical cure having been effected, so that those infected with this disease are often doomed to drag out a long life of misery, a melancholy spectacle to all who behold them, while they themselves are so little conscious of the pitiable appearance that they make in the eyes of others, that they embrace every opportunity of showing themselves in public in the most gaudy carriages that can be found, drest out in the finest attire, which, like the principal character in many of the scenes of Holbein's famous dance of death, when a part of the dress only is seen, may convey the idea of a goddess; but when the grim visage is directed unexpectedly upon us, "grinning horribly a ghastly smile," like the gorgon shield it petrifies the soul with horror, so as to deprive it for a time of every other sensation.

This malady is so general among the rich, and even in some constitutions among the poor, more especially if they are related or wish to be allied to the rich, so malignant in its nature, and frequently so unaccountable in its cause, that it calls for every exertion to eradicate it; and I hope, sir, that the faculty, from the suggestions and imperfect hints thrown out in this letter, will take it into their most serious consideration, and endeavour to find some remedy adequate to the evil. Perhaps extract of *rue* might prove of some avail, if any measures could be adopted for inducing the patient to swallow it, towards which, however, I have been told, they discover an extreme repugnance.

But that I may no longer trespass upon your indulgence, and that of your readers, I will for the present conclude, reserving the further account of the sufferings of the rich, and of our plan of relief, for future communications, should this be honoured by your approbation and insertion. I am, sir, your obedient humble servant,

CLEMENT BIRCH, Sec.

P. S. Communications to be addressed to the office of the society, opposite the bank of England.

Particulars with respect to the Family and Papers of Christopher Columbus, the discoverer of America; and concerning other early authors on the subject of American history. Communicated by Colonel Tatham.

I HAVE often thought that it would be a very laudable attention to the accommodation of historians, if

material facts, which travellers casually discover, were either transmitted to some place of general national deposit, or were published by observers themselves in some periodical work, which might perpetuate them for the benefit of society, and have a tendency to elucidate circumstances which are often left to doubts and conjecture.

Under this persuasion, when I was in Spain in 1796, I was at considerable pains to search for every thing obtainable touching the family and writings of Christopher Columbus (in Spanish, "Christoval Colon,") that great and illustrious adventurer, who first dared to quit the coasts of Europe in search of foreign lands, previously conceived to exist in no man's imagination but his own; and whose perseverance in traversing a wide and unknown ocean has left a too thankful world so highly indebted for a knowledge of that extensive territory which affords an universal asylum for that surplus of increasing population which would otherwise most probably have fallen a sacrifice to the sword.

At Sevilla, in Andalusia, I found the monument of one of his sons in front of the great altar in the cathedral of that city. His tombstone is a white marble flag of about seven feet in length, with a smaller flag on each side of it, forming the arms of a cross, and containing each of them a representation of one of the three galleys in which he first traversed the Atlantic Ocean, on his discoveries of America. These flags form a part of the floor of the cathedral, and are surrounded by a border of plain black marble, about six or eight inches wide, corresponding, as near as my eye

could commit it to paper, with the annexed drawing, which I was permitted to take by piecemeal day after day during divine service. And I confess, that I feel indebted to an inward glow of indescribable veneration for the admiral's memory, for that fortitude on the occasion which enabled me to brave the inquisitive, and wonderfully surprised looks of a thousand seemingly jealous spectators.

The description of this monument is so clear that it cannot be misunderstood. The only thing that can be deemed curious in it is the portrait of the two galleys we may suppose to have been an exact representation of those in which Columbus set out on his discovery, one of which is exactly delineated in the annexed sketch.

The Inscription which occupies the middle slab runs thus.

AQUI YAZÉ EL M. MAGNIFICO S. D. HERNANDO COLON EL QVAL APLICÓ, Y GASTO TODA SV VIDA Y HAZIENDA EN AVMENTO DE LAS LETRAS, Y JYNTAR, Y PERPETVAR EN ESTA CIVIDAD TODOS SUS LIBROS D TODAS LAS SCIENCIAS QUE EN SV TIEMPO HALLO Y EN REDUCIRLO A QUATRO LIBROS. FALLE @ °. EN ESTA CIVIDAD A 12 DE JULIO DE 1539, DE EDAD D 50 ANˆOS, 9 MESES, Y 14 DIAS, FVE HIJO D L VALEROSO, Y MEMORABLE S. D. CHRISTˆ. COLON PRIMERO AL MI.te QUE DESCUBRIO LAS YNDIAS, Y NVEVO MVNDO, EN VIDA D LOS CATˆ. R. D. FERNANDO Y D YSABEL D GLORIOSA MEMORIA, A 11 D OCT. D 1492 CON TRES GALERAS Y 90 PERSONAS, Y PARTIO DL PVERTO D PALOS A DSCVBRIRLAS, A 3 D AGOSTO ANTES Y BOLVIO A CASTILLA CON VICTORIA A 7 DE MAIO DL ANˆO SIGVENTE, Y TORNO DSPVES OTRAS DOS VECES A POBLARLO QUE DSCVBRIÓ. FALLECIO EN VALLADOLID A 20 DEA AGOSTO DE 1506. ANˆOS, ROGAD A DIOS POR ELLOS.

“ A Castilla y a Leon,”

“ Nuevo Mundo dio Colon.”

ASPICE QUID PRODEST TOTUM SUDASSE PER ORBEM
ATQUE ORBEM PATRIS TER PERAGRASSE NOVUM
QUID PLACIDI BŒTIS RIPAM PINXISSE DECORAM
DIVITIAS GENIVM POST HABVISSE MEUM.
UT TIBI CASTALLI RESERAREM NVMINA PONTIS
OFFEREMQUE SIMUL QUAS THOLOMEUS OPES
SI TENVIS ALTEM TRANSCURRENS MVRMVRE SAXVM,
NEC PATRI SALVE NEC MIHI DICIS AVE.

I have the satisfaction to add, that many of his (Christoval Colon's) manuscripts are said to be still in good preservation in the library of that cathedral, and in the royal collection, which I was afterwards told were deposited at Simancas, near the confluence of the three rivers Adaja, Duero, and Pisuerga, in the province of Valladolid; which place circumstances unfortunately compelled me to pass without stopping.

As the Spanish inscription is not generally understood, I have thought it proper to render the information it contains in English, as follows:

Translation of the Tombstone.

“ Here lies the most magnificent Hernando Colon, who dedicated his whole life and fortune to the increase of literature, and to collecting and perpetuating in this city (*Sevilla*) all the books in every science which he could find in his time, and in reducing them to four volumes.

“ He died in this city the 12th of July 1539, at the age of fifty years, nine months, and fourteen days. He was son of the brave and celebrated Christoval Colon (*Christopher Columbus*) chief admiral of Spain, who discovered the Indies and New World during the life-time of their Catholic Majesties Ferdinand and Isabella, of glorious memory, on the 11th of October 1492. With three galleys and ninety people he set sail from the port of Palos on this discovery the 3d of August; and came back to Castile, crowned with success, the 7th of May, the year following; and returned thither on two more occasions, to make settlements in the countries which he had discovered.

“ He died at Valladolid the 20th of August, in the year 1506.

“ *Pray to God for them.*”

There can be no doubt that this Ferdinand is the same person who wrote the life of his father, from whence Mr. Edwards, in the first volume of his History of the West Indies, has extracted the following description of Columbus's person and manners.

“ Fue el almirante hombre di bien formada, y mas que mediana estatura; la cara larga, las mexillas un poco altas; sin declinar à gordo ò macilento; la nariz aquilina, los ojos blancos i de blanco de color encendido; en su mocedad tuvo el cabello blondo; pero de treinta anos ia le tenia blanco; en el comer, i beber, i en el adorno de su persona era mui modesto i continente; afable en la conversation con los estranos, i con los de casa mui agradable, con modestia e gravedad: fue tan observante de las cosas de la religion, que en los ayunos, i en recar el oficio divino, pudiera ser tenido por profeso en religion; tan enemigo de juramento, i blasfemia que yo juro, que jamas le vi echar otro juramento que per San Fernando; y quando se hallaba mas irritado con alguno, era su reprehension decir le: os doi à dios porque hic isteis esto ò dijisteis aquello: si alguna vez tenia que escribir, no probaba la pluma, sin escribir, *Jesus cum Maria, sit nobis in via*; y con tan buena letra que bastàra para ganar de comer.”

La Hist. del Almirante Don Christ. Colon. C. 3.

“ The admiral was a man of a handsome figure, and above the middle size, with a full countenance,

the cheek-bones rather high, without being either fat or lean: his nose was aquiline; his eyes light; of a fair skin and florid complexion; in his youth his hair was light-coloured, but at thirty years of age it was already grey: in his eating and drinking very temperate; and in his dress grave and unassuming: he was affable in conversation with strangers, and with those of his own family; when at home remarkably agreeable, with becoming gravity and propriety of manners: he was so exact an observer in religious matters, that in fasting, and in performing divine service, he might have been supposed to have been in orders. So great an enemy to swearing, that I protest I never heard him swear, but by *Saint Ferdinand*. Whenever he had occasion to write, he never tried his pen, without first writing, *Jesus cum Maria, sit nobis in via*; and his writing was so fair, that he might have gained a maintenance by it."

But finding on the tomb of the son, as before related, an account of the father's death in Valladolid, I was inclined to suppose some mistake in Mr. Edwards's statement. I accordingly pursued my inquiry personally to Valladolid, having it in view to obtain his most Catholic Majesty's, or the church's permission, to remove the tombstone of this general discoverer to the seat of the American government. The following copy of my letter to his heir, whom I found living at Burgos (and who, I understood, had just recovered the estates of his illustrious ancestor by a suit at law, and possessed himself of many valuable documents during his investigations of the title), will shew

my sense of the subject, and my disappointment, touching the expected gratification.

*To Lord Joseph Joaquín Columbus,
of Larreatqui;
Member of the Grand Council of Castile, &c.
residing in Burgos.*

SIR,

Bilboa, July 30, 1796.

I TAKE the liberty of requesting from you (with a view to historical matter) such facts or documents, as may be in your power, touching the *certain* place of the death, burial, monument, or other remembrance of your great ancestor Christoval Colon, the discoverer of America, whom we inhabitants of the United States of America call "Christopher Columbus."

"It will be to us an interesting thing to ascertain various points, about which former historians may happen to differ; and to this end a copy of the family pedigree, a knowledge of, and where any painting of him exists, from which a good engraving of him may be handed to posterity; whether the one contained in *Muaox's historia de nuevo mundo* is understood to be a good likeness; from whence that was taken, as it is supposed to have an appearance of truth more than some others; and such traces as his descendants may have preserved will be desirable.

"On my landing in this country in January last, I was at considerable pains to investigate this subject; I found at Sevilla the tomb of one of his sons, who is interred in the cathedral of that city, which I have carefully transcribed; and, as this refers to Valladolid

as the place of his death, I was in hopes to have found that plain stone which historians have described to contain only

“CHRISTOVAL COLON.”

“But upon examining the cathedral of that city, I observed the flags had been renewed in *modern* times and stile; and, seeing one of the stones of some antiquity cut through the middle of the letters to make it fit its particular square in the floor, I feared that the ignorance of the workmen might have destroyed a relic which we should esteem precious.

“The keeper of the church records assured us, that no such person had ever been interred there; but, as all this was hurried over, and we had not time for a regular research, I prefer a conjecture, that his recollection might deceive him; or that the remains of this inestimable man may be found in some other of the forty-six religious edifices, which I am told that city contains, including fifteen parochial churches.

“At this place I heard of your residence in Burgos; and, on my arrival at that delightful situation, it was a mortification to me, that the want of sufficient language and introduction forbade me to visit the living evidences of *his* existence, who hath left ungrateful mankind in arrears to his bravery for that immensity of space and temporal blessings which, under the administration of moderation and justice, will go far to supply the greedy wants of man; and stop the torrent of human bloodshed, which must otherwise become a consequence of overflowing propagation.

“If it will not be displeasing to you to learn, that six

millions of people in the United States have bestowed the name of *Columbia* on the territory of their metropolis; and that Christoval Colon, our benefactor, is still alive in the warmth of our gratitude. I have the honour to be, &c. W. TATHAM."

I must ever regret that the untoward circumstances of the times obliged me to quit that country before an answer could have been returned to this letter; and farther, that the present state of Europe gives me no room to hope that any literary communication with that country can take place till the return of peace, which may God send soon.

I may add with respect to Spanish publications touching American history, that few have come in my way except the writings of Garcia de la Vega (to be had at Sevilla), Muaoz de nuevo mundo, and Clavigero's *Conquista de Mexico*. The works of Ulloa are known, and frequently cited by English historians; possibly the voluminous works of Pons on *Spain*, may discover some valuable documents, through his very minute attention to detail in the particular cities of that kingdom.

I have understood that *two* distinct works concerning de Soto's four years campaigns in America have been published in the English language.

One is said to be a compilation from the oral relations of a dragoon, who was upon that service; and the other by a gentleman of de Soto's suit, who left but two manuscript copies; of one of which (from the duke of Alva's library) there is a translated copy in the hands of Dr. Benjamin Smith Barton of Phila.

delphia, of the authenticity whereof I have the highest confidence from circumstances corroborating at this day, although but recently become known to us. I find in this history that *Ortiz*, a native of Spain, who was found among the Indians of Florida, where he had been a prisoner several years when de Soto landed there, had, together with others, been decoyed on shore by the stratagem of placing a letter in a split stick upon the beach, as if it had been left by Europeans for the information of their countrymen. This circumstance (strengthened by the discovery of some tools of metal at an inland town) proves clearly that Ferdinand de Soto's party were not the first Europeans with whom these Indians were acquainted; and I think the various works in the interior of America, even upon the banks of the river Ohio, are convincing proofs of a defective history touching the early adventures of Europeans into the forests of the American continent.

To the Violet.

AND shall the Muse to thee her praise deny,
Thou best, thou most diminutive of flowers?
For where can nature, through her wide domains,
Boast other odours half so sweet as thine?
What! Shall I SOPHY scorn, 'cause SOPHY's small?
Though small she be, is she not still a gem
Which worlds of massy gold could never buy?
You too, ye Violets! might I ever wear,
E'en as I wear my SOPHY in my heart!
Though the strip'd tulip, and the blushing rose,
The polyanthus broad with golden eye,
The full carnation, and the lily tall,
Display their beauties on the gay parterre.

On the Varieties of Plants.

In costly gardens, where th' unlicens'd feet
 Of rustics tread not; yet that lavish hand,
 Which scatters violets under every thorn,
 Forbids that sweets like these should be confin'd
 Within the limits of the rich man's wall,
 So fares it with the world: albeit we see
 Some gewgaws which the great alone possess,
 Whate'er is solid good is free to all.
 Let grandeur keep its own! This fragrant flower
 Was kindly given by nature to regale
 The wearied plowman, as he home returns
 At dusk of ev'ning to that dear abode
 Where all his comfort, all his pleasure's lodg'd,
 Young rosy cherubs, and a smiling wife.
 If he may profit these, he'll jewels call
 Those big round drops that stand upon his brow,
 The badges of his labour and his love.
 The thought that these from him their good derive,
 And that that good hangs on this single arm,
 Turns toil to luxury, to pleasure pain:
 'Tis this that cools the sun's meridian blaze,
 Bears up his heart, rebraces every nerve,
 And sends fresh vigour to his fainting soul.
 How far more blest is industry like this,
 Than schemes of statesmen, who, for private ends,
 Would plunge their country in a gulf of woes!
 And know, ye great, howe'er ye may despise
 The rustic's labour, 'tis to that we owe
 A nation's happiness, a kingdom's wealth,
 Wisdom in council, terror in our arms,
 At home security, and fame abroad.

P. HOMER.

For Dr. Anderson's Recreations.

ON THE VARIETIES OF PLANTS.

SIR,

THE indulgence which you have hitherto showed to my poor remarks emboldens me to offer a

few farther hints that may be adduced as corollaries to some of those facts which you have established in the foregoing Numbers of this work.

It has been long known that certain plants, particularly annuals, in the language of the florist, when raised from the seed, *sported* very much, thus producing individual varieties almost without end; but as others, raised from seeds, varied less from each other, this fact was only considered as a particular exception to a very general law in nature; and it was supposed that most plants produced their like from seeds without any sensible variation. I think, however, that you, sir, have been the first person who has attempted to draw the line which separates between the general law that animals, as well as vegetables raised from seeds, have a perpetual tendency to produce their like, at the same time that lesser diversities are produced without end; and in particular that no two trees that have been raised from seeds are perhaps to be found on the globe which do not differ individually from each other in some of their essential characteristics or qualities, notwithstanding the general resemblance that subsists between all those of the same species; and have pointed out at the same time the uses that may be made of this peculiarity by the attentive economist. Since you first mentioned this fact, I have been as particular in my observations as possible in regard to all those trees and shrubs that are usually reared from seeds that have fallen in my way, and the result is a perfect conviction, not only that the remark is just; but also that, by keeping this fact perpetually in our eye, and being careful to remark the valuable peculiarities of every

individual wherever it occurs, so as to propagate and perpetuate the kind, it will be the source of great and important benefits to society.

It has, it is true, been long understood by sensible men that all the varieties of apples and pears we cultivate in our gardens have been discovered accidentally among wildings that have been reared from seeds, and afterwards perpetuated by budding or grafting; but this fact has obtained a mere passive assent, without seeming to have stimulated any active exertions in research by the application of it to other similar cases. As if nature were exhausted, we discover no sort of desire to augment the number of these useful varieties, unless it be among gooseberries, for some years past (and the success that has attended these efforts ought certainly to have extended them to others). We have also of late got some exotic varieties of the *Pyrus* tribe imported from distant countries, and now reared among us as curious ornamental shrubs, such as the *Pyrus spectabilis*, several varieties of the Siberian crab, one with red fruit, another with yellow, the double blowing China crab, the Tartarian crab, &c. which prove highly ornamental. This we do without seeming to advert, that were we accurately to examine the crabs that grow wild in our own hedges, we might obtain many varieties as beautiful as these, and some perhaps possessing valuable qualities that no apple hitherto cultivated in our gardens can equal. Nor have I a doubt but there are at this moment existing in different gardens in remote parts of the country, particular and valuable varieties of the apple that have been transplanted thither from the hedges many years ago by curious

persons who have remarked them there, that are not at all known to our nurserymen, and which have never been heard of in other districts. Let any person with this view traverse the county of Hereford, or any other district where crab hedges are common, towards the end of October, and he will not fail to discover a diversity that will surprise and delight him. Many of these no doubt, which look beautiful, will be austere and good for nothing; but he will find not less diversity in taste and flavour, than in form and colour; some of them excellent.

My design in this paper, however, is rather to turn the attention to another class of fruit-bearing plants; the vine. This plant is so easily propagated by layers or cuttings, that few people, I believe, ever think of rearing it from seeds, though nothing is more easy than this would be; and kinds might thus be discovered that would be very beneficial. It has long been a question among antiquarians, whether the word *vineyard*, which occurs so often in the records of monasteries, and other religious establishments in this country, actually denoted a garden in which vines were reared in the open air for the purpose of making wine, or whether the term was not applied to gardens producing other kinds of fruit that afforded a vinous liquor. Without pretending to decide on this question, I should think, that as the word was understood in its present sense during the time that these records were written, and never, that we know of, in another sense; it is not probable they would have inadvertently employed that term to denote any thing else, but would

have taken notice of that deviation of meaning. I am therefore convinced it applies to the vine plant only: nor do I think it at all improbable that luxurious monks who wished to live well, and were precluded from obtaining foreign wines, because of the deficiency of trade in those days, might have bestowed unusual pains to obtain this luxury of life; for, even in the present state of things, we know that in a favourable season, and in a warm situation, some kinds of grapes ripen in the air in this country. In these favourable seasons, then, they could have wine, and in other seasons they must have contented themselves with applying the grapes to some other inferior uses.

Could we indeed suppose that a plant which is so vivacious, and at the same time so durable as the vine, could ever through neglect be totally extirpated in any country where it had once been cultivated, we might give a very satisfactory solution of this problem, by supposing that they then possessed a kind of vine which ripened its fruit much earlier in the season than any of those that are now known to us. This, however, is a supposition that I can by no means admit as probable. If men had once known a grape that ripened in the open air in this country in ordinary seasons, I cannot think that any of those revolutions that ever took place in this country were such as could have occasioned it to be lost. From this consideration, I am inclined to believe that there never has been an earlier kind of grape cultivated in this country than those kinds we now have here. But though this should be the case, it by no means follows that it is

not possible to obtain an earlier kind of grape than ever has been yet cultivated. The circumstance of the vine being so long in coming into a bearing state after it is reared from seed, renders it probable that few attempts have been made thus to obtain varieties of this plant; and there is every reason to believe that the few varieties we have of it have been all obtained from seedlings that have sprung up in desert places from seeds that have been dropped by birds; a thing that can but seldom take place now in Europe. But among these varieties we find a great diversity in regard to their time of ripening. Some of these sorts are so late as never to show their fruit at all in the open air in this country, while others ripen completely in an ordinary season. What I wish to recommend to the attention of your young readers, then, and others, is, to sow the seeds of the earliest kinds of grapes in abundance each season; and when the plants have acquired sufficient strength, plant them out in rows in a situation where a rail can be placed behind them to support their shoots. They need not be more than six inches apart; so that a small patch of ground will serve for a great many; let them be cut down to one eye each season, and no more than one shoot be permitted to spring out until they show fruit, which should be particularly observed, and its qualities remarked. As a standard for earliness, let one plant of the common muscadine vine be planted in the same row; when the fruit has once made its appearance, let all the worthless kinds be thrown out, and the valuable kinds alone preserved, till the qualities of the

fruit have been distinctly ascertained. In this way I have no doubt but in a course of years some very valuable kinds might be discovered that would ripen well in this climate; and in the mean time, I know few amusements that would be more engaging than that of watching the progress of the vines. I myself can only attempt this upon a small scale, and in an unfavourable situation; but I shall attempt it. There are many men of fortune, however, who have extensive gardens, in which these experimental trellises would make a very pretty show, to whom it could prove in no respect inconvenient. To such as choose to adopt this amusement, I would strongly recommend to save the seeds themselves, and see them put into the ground with their own eyes to prevent deceptions; and if they chose to diversify the experiment by trying seeds picked from the finest clusters of grapes imported from abroad, or from some of the best kinds of sun-dried raisins, they would only tend to render it the more interesting.

If you shall think this worthy a place in your useful miscellany, it will confer an additional favour on

A YOUNG OBSERVER.

For Dr. Anderson.

SIR,

THOUGH I observe you are very difficult to please respecting poetry, I hope you will find no difficulty in indulging me by inserting the following in your agreeable miscellany, which I am persuaded will please many of your readers, and afford a high gratification to

A CONSTANT READER.

Ode addressed to Dr. Robert Anderson, of Heriot's-Green, Edinburgh, after a visit paid him by the Author, and various pedestrian excursions in Scotland. By G. Dyer.

I.

WHERE is the king of songs? * He sleeps in death:
No more around him press the mail-clad throng;
He rolls no more the death-denouncing song;
Calm'd is the storm of war, and hush'd is Ofsian's breath.
Low lies the bard: but still near Caron's stream
Resounds in fancy's ear his mournful lyre;
And oft where Clytha's winding waters gleam,
Shall pilgrim poets burn with kindred fire.
Sunk is the poet's eye—but shines his name,
As, mid obstructing clouds, still lives the solar flame.

II.

Where now Dunbar? The bard has run his race:
But glitters still the Golden Terge on high;
Nor shall the thunder storm, that sweeps the sky,
Nor lightning's flash the glorious orb deface.
Dunkeld, no more the heaven-directed chaunt
Within thy sainted wall may sound again:
But thou, as once the muse's favourite haunt—
Shalt live in Douglas' pure Virgilian strain:
While time devours the castle's towering wall,
And roofless abbies pine, low-tottering to their fall.

III.

Oh! Tweed, say, do thy rolling waters glide
With patriot ardour, or with bigot rage?
In union dost thou distant friends engage?
Or flow, a boundary river to divide?
If love direct, roll on, thou generous stream,
Thy banks, oh! Tweed, I kiss, and hail thee friend:
But while thy waters, serpent-winding gleam,
Should serpent treacheries on thy course attend,

* Ofsian.

Ode to Dr. Robert Anderson.

How should my feet thy banks disdainful rove!
 Mean is the flower of song, unless it breathes of love.

IV.

But, no, my friend: I read thy candid page,
 And trace the footsteps of a manly mind:
 Be mine, with chaplets Scotian brows to bind,
 While England's bards thy studious hours engage.
 The Highland nymph shall melt with England's lay;
 And English ears be charm'd with Scotia's song;
 Though rude the language, yet to themes so gay
 The softest streams of melody belong.
 Still, Ramsay, shall thy Gentle Shepherd please,
 Still, Burns, thy rustic mirths, and amorous minstrelsies.

V.

Oh! may I view again with ravish'd sight,
 —As when with thee, my Anderson, I stray'd,
 And all the wonder-varying scene survey'd,—
 Seas, hills, and city fair from Calton's height!
 And hear (for Scotia's rhymes, ah! soon shall fail),
 Some Ednam bard awake the trembling string,
 Some tuneful youth of charming Tiviot-dale,
 Some Kelso songstrefs love's dear raptures sing.
 Language may change; but song shall never die,
 Till beauty fail to charm, till love forget to sigh.

*Acknowledgments to Correspondents, on account of the absence of the
 Editor, necessarily postponed.*

20.

OCTOBER 1800.

RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 2. VOL. IV.

AGRICULTURE.

PRACTICAL REMARKS ON THE MANAGEMENT
OF THE DAIRY, PARTICULARLY IN RESPECT
TO THE OBTAINING OF BUTTER.

[Continued from page 12, and concluded.]

Part 7th. *On the Utensils for the Dairy.*

IN every part of the foregoing process it is of the utmost importance that the vessels, and every thing else about the dairy, be kept perfectly clean and sweet, for, without this precaution, there neither can be pleasure nor profit derived from it. This is a circumstance so universally admitted, that it may seem superfluous to take notice of it in this place. Yet, though it be

VOL. IV.

G

generally known and admitted, and though every person who attempts to manage a dairy of any sort may intend to have things clean and proper, they may nevertheless be, in some cases, at a loss for the proper way of effecting their intentions, or of guarding against certain evils, which, if once allowed to take place in the dairy, will not be easily removed. Some directions are given in a note at the end of this article for this purpose. See note A, p. 89.

On some occasions a part, or the whole of the butter may, perhaps, be disposed of fresh; but in general it must be salted before it can be carried to market. And as this part of the process requires as great nicety as any other, a few remarks on the subject shall be added.

Wooden vessels are, upon the whole, most proper to be employed for containing salted butter. These should be made of cooper work, very firm, and tightly joined with strong *wooden* hoops. It will be advisable to make them very strong where circumstances permit them to be returned to the dairy; for as it is a matter of considerable difficulty to season new vessels so well as that they shall not affect the taste of the butter, it is always advisable to employ the old vessels rather than make new ones, as long as they continue firm and sound. Oak is the best wood for the bottom, and staves and broad Dutch split hoops are to be preferred to all others, where they can be had. Iron hoops should be rejected, as the rust from them will in time sink through the wood, though it be very thick, and injure the colour of the butter: one iron hoop, however, should be put at the top, and another;

below beyond the bottom, the projection, below the bottom being made deep for this purpose. No form is more convenient than that of a barrel, unless, perhaps, it be that of a truncated cone, with the apex uppermost; as in this case the butter never can rise from the bottom, and float upon the brine, which it will sometimes do in the under part of a barrel when brine is necessary. But this inconvenience may be easily obviated, by driving a wooden peg with any kind of a head into the bottom before it be filled, as the butter, closely embracing that head all round, will be kept perfectly firm in its place.

An old vessel may be prepared for again receiving butter by the ordinary process of scalding, rinsing, and drying; but to season a new vessel requires greater care. This is to be done by filling it frequently with scalding water, allowing that to remain till it slowly cools. If hay, or other sweet vegetables are put into the vessel along with the water, it is sometimes thought to facilitate the process. But in all cases frequently affusions of hot water are very necessary; and a considerable time is required before they can be rendered fit for use. The careful *dai* ought to be particularly guarded with respect to this particular, or he may soon lose his character at market.

After the butter has been beaten up and cleared from the milk, as before directed, it is ready for being salted. Let the vessel into which it is to be put, after being rendered as clean and sweet as possible, be rubbed all over in the inside with common salt, and let a little melted butter be run into the cavity between the bottom and the sides at their joining all round, so as

to fill it, and make it every where flush with the bottom and sides. It is then fit to receive the butter.

Common salt is almost the only substance that has been hitherto employed for the purpose of preserving Butter; but I have found, by experience, that the following composition is, in many respects, preferable to it; as it not only preserves the butter more effectually from any taint of rancidity, but makes it also look better, and taste sweeter, richer, and more marrowy, than if the same butter had been cured with common salt alone." I have frequently made comparative trials with the same butter, and always found the difference much greater than could well be conceived. The composition is as follows:

Take of sugar one part, of nitre one part, and of the best Spanish great salt (or the best salt you can find) two parts. Beat the whole into a fine powder, mix them well together, and put them by for use.

Of this composition one ounce should be put to every sixteen ounces of butter, see note B, p. 92; mix this salt thoroughly with the butter as soon as it has been freed from the milk, and put it without loss of time down into the vessel prepared to receive it, pressing it so close as to leave no air-holes, or any kind of cavities within it. Smooth the surface, and if you expect that it will be above a day or two before you can add more, cover it close up with a piece of clean linen, and above that a piece of wetted parchment, or, for want of that, fine linen that has been dipped in melted butter, that is exactly fitted to the edges of the vessel all round, so as to exclude the air as much as possible, without the assistance of any watery brine. When more butter is to

be added, these coverings are to be taken off, and the butter applied close above the former, pressing it down and smoothing it as before, and so on till the vessel be full. When it is quite full, let the two covers be spread over it with the greatest care, and let a little melted butter be poured all round the edges, so as to fill up every cranny, and effectually exclude the air. A little salt may be then strewed over the whole, and the cover be firmly fixed down, to remain close shut till it be opened for use. If all this be carefully done, the butter may be kept perfectly sound in this climate for many years. How many years I cannot tell; but I have seen it two years old, and in every respect as sweet and sound as when it was only a month old.

It deserves to be remarked, that butter cured in this manner does not taste well till it has stood at least a fortnight after being salted; but after that period is elapsed, it eats with a rich marrowy taste that no other butter ever acquires; and it tastes so little salt, that a person who had been accustomed to eat butter cured with common salt only, would not imagine it had got one fourth part of the salt that would be necessary to preserve it. See note C, p. 93.

Butter thus cured would bear to be carried to the East or the West Indies, and would keep sweet during the longest voyages, if it were so packed as not to allow the butter to be so far melted as to occasion the salts to separate from it. But as none of these salts admit of any chemical union with the butter, it must happen that if ever the butter be so far melted as to become of a fluid consistence, the salts drop to the bottom, and the butter, deprived of their antiseptic

powers, quickly becomes rancid. It would be a great improvement in the culinary art, if any antiseptic substance could be found that possessed an agreeable taste and flavour, which was capable of being dissolved in oily substances. This might afford a proper subject for a premium by the Bath, or other Societies. In the mean time the following hints on this subject may be of some use.

Butter, in its natural state, contains a considerable proportion of mucous matter, which is more highly putrescible than the pure oily parts of the butter. Where it is, therefore, intended that butter should be exposed to the heat of warm climates, it ought to be freed from that mucilage before it be cured and packed up for keeping. To prepare butter for a distant voyage, therefore, in warm climates, let it be put into a vessel of a proper shape, which should be immersed into another containing water. Let the water be gradually heated till the butter be thoroughly melted; let it continue in that state for some time, and allow it to settle; the mucous part will fall entirely to the bottom, and the pure oil will swim at top, perfectly transparent while hot, but when it cools it becomes opaque, assumes a colour somewhat paler than the original butter before it was melted, and a firmer consistence, more nearly resembling that of tallow, and consequently it will better resist the heat of a warm climate than butter itself. When this refined butter is become a little stiff, and while it still is somewhat soft, the pure part should be separated from the dregs, and then salted, and packed up in the same way as is directed for butter. This would retain the salt longer, and keep much

longer sweet, in hot climates, than if it had been cured in its original state.

This refined butter may be preserved in yet another way, which I have sometimes seen practised here by way of medical *bonne bouche* (comfit). After the butter is purified, add to it a certain proportion of firm honey, mix it well, it will incorporate thoroughly with the butter, and when cold it eats very pleasantly spread on bread, like butter; and may be given to old people, if they relish it, instead of marrow, and to others, as being useful for coughs and colds. These were the uses to which I have seen this substance applied, and on these occasions the proportion of honey employed was considerable. I have seen it kept for years, without manifesting the smallest tendency to rancidity, so that there can be no doubt but that butter might thus be preserved in long voyages without spoiling. The only point that remains to be ascertained is, what is the smallest proportion of honey that would be sufficient to preserve the butter. Sugar is known to be a much more powerful antiseptic than common salt, and probably honey may be in that respect nearly on a par with sugar. If so, it would be reasonable to suppose that one ounce of honey might be sufficient to preserve sixteen ounces of butter. In that case the taste of the honey would not be extremely perceptible, so that the butter, even to those who might not relish the sweet composition above mentioned, might prove very agreeable, especially if a little salt were mixed with it when about to be used. A few experiments would be sufficient to ascertain this particular.

From the circumstance of the honey incorporating

with the butter, and not separating from it while in a fluid state, it would promise nearly to accomplish the purpose wanted above. Whether, when it became very fluid, and was long continued in that state, any separation would take place; or whether the honey in these circumstances would be in danger of fermenting, are questions that experience alone can determine. Sugar, though it would preserve the butter equally well while it continued in a solid state, would doubtless separate from it when it became fluid. Whether melasses would do so; or what effects they would in this case produce, I cannot tell; but a few experiments would ascertain these points. Should any method of preserving butter in warm climates be discovered, it would be productive of so many benefits to individuals, and to the nation at large, by giving an opening for a new branch of commerce and manufacture, that it is much to be wished the few experiments wanted to ascertain these points were made with such care, under the direction of persons who would faithfully report the result to the public, as should be sufficient to remove all doubts upon this head.

POSTSCRIPT.

The greatest part of the observations contained in the foregoing pages were derived from a lady, who is now beyond the reach of being affected by any thing in this sublunary world. Her beneficence of disposition induced her never to overlook any fact or circumstance that fell within the sphere of her observation, which promised to be in any respect beneficial

to her fellow-creatures. To her gentle influence the public are indebted, if they be indeed indebted at all, for whatever useful hints may at any time have dropt from my pen. A being, she thought, who must depend so much as man does on the assistance of others, owes as a debt to his fellow-creatures the communication of the little useful knowledge that chance may have thrown in his way. Such has been my constant aim: such were the views of the wife of my bosom—the friend of my heart, who supported and assisted me in all my pursuits. I now feel a melancholy satisfaction in contemplating those objects she once delighted to elucidate.

Notes accidentally omitted in printing the Text.

(A) *This refers to page 82.*

As soon as the cream is separated from the milk, the dishes should be carried out of the milk-house, and immediately emptied, and the skimmed milk applied to the uses that the owner of the dairy judges to be most advantageous to him. As soon after the dishes are emptied as possible, they must be well washed with scalding hot water, which should be kept in readiness for that purpose; and, as the naked hand cannot be put among the scalding water, a scrubbing brush of a proper construction must be kept in readiness for that use. This may be made of a bunch of wire, firmly bound up with strong packthread, where other materials cannot be had; but the stumps of an old heath-besom (*broom*), after the small twigs have been worn off, firmly bound together, are found to answer this purpose remarkably well: nor ought any thing else to

be sought for where that can be had; for this is both firm and tough, so as to stand the work extremely well.

After the dishes have been thus perfectly scalded, and thoroughly scrubbed in every part, they must be carefully rinsed with blood-warm water, and well scoured by hand with a coarse linen cloth. They are then to be turned down one by one as they are finished bottom upwards, upon a clean shelving board to drip. When the whole are gone over in this way, the dairy-maid returns to the first done, and with a dry cloth wipes them one by one as clean as possible. They are then placed in ranges, so as to be exposed fully to the action of the sun and air on the inside, that the whole of the moisture may be dried up as quickly as may be; for nothing tends so soon to destroy the sweetness that is so desirable in dairy vessels, as for the moisture to be allowed to remain long about them. Therefore, in dull foggy weather, when this cannot be quickly dried up by the external air, it is necessary to do it by the aid of fire in the house. As soon as the dishes are thoroughly dried, they must be carried into the shade, and placed in order on shelves to cool, to be in readiness for use when they shall be again wanted.

But should the milk have been suffered at any time to remain so long in the dish as to become sour, the wood instantly becomes tainted with that acidity, so as to act as a leaven upon any milk that shall be afterwards put into it, which never fails to coagulate without separating any cream, and can neither be employed in making butter nor cheese, and is consequently lost

in the dairy. The scalding above described is by no means sufficient to remove this destructive taint; and, as the dishes are totally useless till that be removed, the following more efficacious process must be adopted.

Fill the vessel with water scalding hot, and into that put a considerable quantity of hot ashes, and small red embers from the fire. Stir it about frequently, scrubbing it well in every part with the scrubber. Let this remain a considerable time; then empty the dish, scrub it as usual with scalding hot water, rinsing it well with hot, and then with cold water. Then fill it to the brim with cold water, better if that water can be made to run into it in a continued stream, and flow over the brim; let it stand in this state ten or twelve hours, or more, after which wipe and dry it, and if the taint has not been very strong, it will then be fit for use.

If the ashes of your fire should chance to contain very little salt, this operation may perhaps not prove effectual. In that case add a small proportion of potashes along with the embers, &c. or quick lime may be employed along with the potashes, which greatly adds to their cleansing power. But in all cases where recourse is had to this process, take great care that the dishes be well cleaned by the rubber at each time; and that cold water be allowed to stand a considerable time in them, which should be frequently changed, that the whole of the salts may be extracted by it before they be used again.

The dishes for holding the cream, and the churn, require to be scalded, scrubbed, rinsed, and dried, after each time they are used, in the same manner as the

milk dishes; but, as a sour taint is not here so prejudicial, it is not necessary to guard so carefully against it as in the milk dishes. But if ever this taint should become too strong, it may be diminished by the process above described.

(B) *This refers to page 84.*

It is of great consequence that every process which requires much thought or nicety, should be banished, if possible, from all branches of manufacture. On this principle, as some difficulty might arise in proportioning the quantity of salt to unequal weights of butter, I should advise that every person who means to adopt this practice at large should begin with providing himself with a steelyard so constructed as that sixteen ounces in the one scale is exactly balanced by one in the other. And that he may be at no loss to provide himself with this simple apparatus, the following directions may be attended to.

Let him provide two scales of equal weight; one of them should be of wood, and flat for the butter, no matter what form or materials the other is of; let him then take a slip of deal two inches broad, half an inch thick, and two feet long. Near to each end, and at about half an inch from the same side at each end, make a hole through the board, to which the scales may be fastened by means of a loop of wire; observe, that these two holes should be placed exactly at the same distance from, and near to the lower edge. Let him then load the two scales, one of them with one ounce, and the other with sixteen, and, having drawn a line parallel to what will now appear to be the upper side of the beam, at half an inch from the top all along on each side, let

him be provided with two sharp-pointed instruments, such as a shoemaker's awl. Let him then try to find a point in the new-made line on each side of the beam, where, when the beam is allowed to vibrate on his awls placed directly opposite to each other, the two weights balance each other. This point he will soon discover to be much nearer one of the ends of the beam than the other. Through this point let him pierce a hole by means of a round hot iron. Through this hole put a piece of thick iron wire, which, if supported at each end, will serve as a pivot. The apparatus is now complete.

And whenever it is afterwards wanted, nothing more is necessary than to place the butter, whatever be its weight, into the butter-scale, and then to put as much of the composition into the opposite scale as brings the beam to a balance; and this will in all cases be the due proportion of salt for the butter, whatever the weight of that butter may be.

(C) *This refers to page 85.*

But after this butter has been cured in the most perfect manner, it may chance to be much debased in its quality by being improperly treated during the time it is using. Therefore observe, that, when it is broken up for use, a small portion should be pared from the surface all over, especially near the edges, in case the air should not have been so entirely excluded as it ought to have been. If it be to be quickly consumed, it may be then spooned up as it is wanted, without any other precaution than that of keeping it carefully covered up so as to exclude dust, &c. from having access to it. But if it be to be used very slowly, and if

the person to be employed in spooning it up be not very careful, or so indolent as not to be at the trouble of closing it up at each time with the covers, it may happen that the part which is thus long exposed to the air may contract a small degree of rancidity. To guard against this evil, in these circumstances, when the vessel is opened let a strong brine of common salt be prepared that will swim an egg, and poured, when cold, upon the surface of the butter; this will cover that surface effectually, even though the operator should be a little careless, and will thus guard against the inconvenience complained of; for though the quality of the butter will thus be injured in some degree, in consequence of the water acting upon it, yet that is an evil of far less material moment than the slightest degree of rancidity would occasion.

A dissertation on the means of improving the construction of waggon, and other carriages employed for the purposes of agriculture.

A PREDILECTION has long prevailed throughout England in favour of large machines for the transporting of goods from place to place, in regard to which the great object of emulation seems to be, to try how an immense load of goods may be transported in *one* carriage, without regard to any other circumstance. But, as this is acting in direct opposition to the best established principles of mechanics, of economy, and of common sense, I shall hope to be excused for entering here pretty much at length into an investigation of this particular; not from any hope that I entertain of being able to eradicate at once prejudices that have

been of so long standing, and so generally received, as with a view to direct the attention of a few to this subject, through whose influence these prejudices may perhaps be gradually weakened, and imperceptibly abandoned.

There is no law in mechanics better established than this, that the proportional strength of the parts of which a machine consists must be greater according to its smaller relative size: for example, if a rod of wood that is ten feet in length and one inch square will just support ten pounds weight, another piece of the same wood twenty feet long and two inches square will not support twenty pounds, but will inevitably break before it receives that quantity; if the beam be forty feet long, and four inches square, it will be unable to bear even such a large proportional weight as that of twenty feet; and so on it goes, gradually decreasing in power as the size of the machine increases, though the same proportions in all its parts be retained, until at length it will reach a point when it can bear no extraneous weight whatever, beyond which, if the size of the machine be augmented, it will be crushed to pieces by the weight of its own materials alone.

This law applies to animals as well as to inanimate existences. Hence it is a general rule, that the larger the size of an animal, the smaller is its proportional strength. If we could find a horse that possessed half the strength or agility of a flea in proportion to its size, it would be a creature of inestimable value; or if the elephant had as much strength in proportion to its size as the mouse, we might almost be able to remove mountains by the united strength of many of

these animals. The Creator of the universe; however, by establishing that law of nature of which we here treat, hath set bounds to the powers of every animated being, and, among others, to man himself. To this law the great Archimedes did not advert when he made answer, that he could move this globe itself had he a fixed point on which to rest his machine. As a mathematical proposition, the thing was certainly easy; as a mechanical problem, it was far beyond the bounds of possibility. The thing that Archimedes overlooked has certainly not been adverted to by the first contrivers of our waggon; who, although they have not attempted to go beyond the bounds of *possibility*, have yet gone so far beyond the limits of *propriety*, as to have subjected themselves to very serious inconveniences. The parts of their machine must be made so proportionally thick, because of the largeness of size on which they have constructed it, that the very weight of the machine itself is a load which not only subjects the owner to a great and unnecessary expence in the purchase, but, what is worse, obliges him to be at a great expence for horses to drag that unnecessary load from place to place, and to be at another continued charge, to no inconsiderable amount, for the purpose of repairing roads which are torn to pieces every where by these ill-contrived, unwieldy, barbarous, machines travelling upon them. This, you will say, is strong language; but if the facts that I shall adduce be well authenticated, you will admit that it is not misapplied. If they be not, it will be a favour done to the public to show in what respects they are erroneous.

A good horse of a moderate size (say from eight to

five hundred weight) will draw with ease, in a well-constructed carriage, upon moderately good roads, a load of *thirty hundred weight*, independent of the carriage, and will travel with it at the ordinary rate for days, or months, or years together. Upon very good roads, he will be able to go on with a load of two tons; but for a horse of that size, we shall consider thirty hundred weight as a proper load.

A carriage, if properly constructed for many kinds of weighty goods, may be made, which, independent of wheels and axle, shall not weigh more than one hundred weight; but for any kind of merchant-goods commonly conveyed along the roads, it need not exceed one hundred weight and a half.

A waggon for the road, if I have been rightly informed, weighs commonly about two tons and a half, including the wheels (say the carriage is two tons), were it then to be loaded at the same rate as the first named carriage above, it should carry forty tons of goods: but, should we attempt to put forty tons of goods of any kind upon such waggon, it would be crushed to pieces by it; even twenty tons would be more than it could bear. Here then we find that the universal rule applies, as in every other case; the larger machine, notwithstanding its proportional massiness, is by much the weaker of the two. Let us now consider it in another point of view.

The load allowed by law to pass upon a turnpike road, I have been assured on authority that I believe to be good (that of the keeper of a weighing machine upon a public road), is as under, including the whole load and carriage together, viz.

	Summer Weight.			Winter Weight.		
	tons.	ct.	qrs.	tons.	ct.	qrs.
Waggon with 9 inch wheels	6	0	0	5	10	0
Ditto 6	4	5	0	3	15	0
Ditto 3	3	10	0	3	0	0
Cart with ... 9 inch wheels	3	0	0	2	15	0
Ditto 6	2	12	0	2	7	0
Ditto 3	1	10	0	1	7	0

The maximum weight, then, allowed for a waggon to carry, is, six tons in summer, and five and a half in winter; from which deduct two tons and a half for the waggon and wheels, and there remain of free load three tons and a half in summer, and three tons in winter. Taking the summer load, and reckoning eight horses (ten are often used in winter), the maximum load for each horse will be a little above eight hundred weight. Taking the winter load at three tons, and the horses ten (which, including the riding horse, is under the number), the load for each horse will be six hundred weight; average for the whole year seven hundred weight. The average of the three inch wheels would be greatly under the half of that for each horse; so that by rating the whole at five hundred weight each horse on a medium throughout the year, it would seem to be a full average.

But we have seen that a moderate sized horse can draw in a proper carriage, with the utmost ease, above thirty hundred weight, which is six times the load carried by the waggon horses! That men should continue to adopt a mode of conveyance which is so enormously expensive, compared to what it might be, is a little wonderful in a country like this, where the expence of transporting goods must form such an essen-

tial article towards the improvement of manufactures and the increase of trade.

We all know, that when a custom is once introduced, it is difficult to eradicate it; but I have often set myself to consider how it could have happened, that a custom so barbarous, and so contradictory to common sense, ever should have gained a footing in this country. Probably it may have been for the purpose of transporting timber to the dock yards, which is a kind of load that on some occasions does not admit of being divided; and which could not be dragged from any considerable distance on bad roads without employing an enormous number of horses. As this was almost the only load that would be transported from a distance before turnpike roads were made, it is probable that men thus came to be familiarised with the idea that no loads could be carried to a considerable distance without the aid of such numerous teams of horses, and that thus they came to be still continued after the roads were made good: but good the roads cannot be made, while these enormous machines are suffered to travel upon them, unless at such an extravagant expence as the country never yet seems to have been able to defray; for the roads, by reason of these burdens, are so torn up in the beginning of winter, as to render them impassable for many months by any reasonable carriage; and thus the expence to those who are under the necessity of employing these carriages is enhanced to a deplorable degree.

Every person who has occasion to transport weight of any kind from one place to another feels the pressure of this evil, and complains of it; but hitherto no

100 *On the Construction and Uses of Waggon.*

one seems to have seriously adverted to the only radical cure that this evil admits of. The number of horses in this island, and the quantity of corn that they consume, have been often pointed out as a most serious grievance; and are especially so at the present time, when the deficiency of crops has occasioned a scarcity approaching to a famine; yet so powerful an influence has habit over the human mind, that no one in this country seems ever to have thought it possible that the number of draught horses could be greatly diminished without occasioning any diminution of the work performed by them, though the facts that prove this have been ascertained by the universal experience of a considerable part of the island continued for upwards of twenty years. So powerful indeed is this prejudice, that I very much doubt whether nineteen persons in twenty of those who shall read this, will not rather feel disposed to think that I myself am under a mistake respecting the facts, than to believe that it has been even so far ascertained that the same thing might succeed here, as to render a fair experiment worth the trying. To perform what is incumbent upon *me* in this business, I shall state a few facts which I know to be true, and which it certainly is in the power of those who have an interest in this case to verify if they shall think proper. If they do not do so, and act as experience shall prove to be right, let them no longer cry out against the obstinacy of farmers, and others of that rank, and against their blind attachment to old customs; for the improvements that I shall mention were introduced by farmers, though directly contrary to the practice of their fathers, and, on many oc-

casions, to the advice and earnest persuasions of their superiors.

It is then a fact universally known, and every day acted upon, by the farmers in the Lothians near Edinburgh, that one ordinary draught horse can draw with ease a load of a ton weight, besides the carriage, either in summer or winter, upon the roads of that country, which are less smooth (though firmer indeed) and more uneven, than those around London; and that a good horse, though of a much smaller size than the waggon horses in this country, can easily carry thirty hundred weight, besides the carriage.

Again, the mercantile intercourse between Greenock and Edinburgh is very considerable; and, notwithstanding the Forth and Clyde canal, it is still found convenient to transport a great many goods by land. This intercourse is chiefly carried on by one person, of the name of Gabriel Watson, in Glasgow, who keeps a large number of horses solely and continually employed in this business. The distance is sixty-eight miles, and the road far from being level. The load for each horse is various; but I have been assured from very good authority, that it is scarcely ever below one ton; that it often amounts to thirty hundred weight; and that twenty-five hundred weight may be deemed an average, throughout the whole year, independent of the carriage.

Again, the horses employed to transport goods from the shore of Leith (which is the sea-port to Edinburgh) are a very inferior set of animals indeed, when compared with those which we see in the drays in London. The price of these horses at the present time may run from five to twenty-five pounds, which would not

average one half of that of the London horses employed for similar purposes. Yet with one of these horses two hogsheads of sugar (about fourteen hundred weight each, that is twenty-eight hundred weight) is an usual load; the distance two miles, and up a hill considerably steep the whole way.

These are facts well known to every person in that neighbourhood who has ever bestowed any attention to things of this nature, and afford good data for reasoning upon. Let us see, then, what inferences we are authorised to draw from a comparison of these with the facts stated in the beginning of this paper.

I conceive that no person will deny, that the same horses under the same management would draw as great a load upon the roads in the neighbourhood of London as of Edinburgh. We have it in our power, indeed, to see proofs of this fact every day under our own eye if we choose to attend to them. In passing through Hammersmith a short time ago, I saw a horse going along with the greatest ease, dragging behind him two hogsheads of beer, loaded upon a small truck with low wheels, not exceeding nine inches diameter. This load was equal to twenty-five hundred weight, besides the carriage, which was not the most easy to draw that could have been constructed; yet he could evidently have drawn much more. I have also seen a single horse drawing bricks with more than that load.

The exact number of heavy draught horses employed in and about London I have no means of ascertaining; but I presume they amount to twenty thousand at least. It has been just now proved, that, under the present

management, they do not carry above one sixth part of the average load that they might easily be made to draw; of course, three thousand three hundred and thirty-three might perform the whole, and sixteen thousand six hundred and sixty-six might be saved. One horse, fed as these horses are, will consume the produce of as much land, as, if properly employed, would sustain four men; hence, this single item of saving would afford food for sixty-six thousand six hundred and sixty-four men (all of which must now be imported from abroad), and this without diminishing the intercourse of the country in the smallest degree! Were we to extend this reasoning to the whole island, the saving would be immense; but I content myself with giving this single glance at it, merely to turn the public attention to that point. I now return to the proper object of our present discussion, which is, the unnecessary weight of the carriages usually employed.

In consequence of the predilection for immense loads, the necessity of having the carriages very strong, to enable them to resist the severe shocks to which they are liable, became apparent; and therefore an injudicious practice was introduced, at a time when the application of mathematical principles to the construction of rustic implements was not thought of. The persons who were employed to construct these machines seem to have had no idea of any other means of augmenting strength than that of adding to the thickness of the parts of which the machine consisted. Hence the greater the bulk of the separate parts, the better they thought it was, because the stronger it was deemed to be; and,

as the expence of one of these enormous implements is greatly enhanced by this inordinate consumption of materials in its composition, it is now nothing unnatural for an uninformed owner to be well pleased at seeing the massiness of the parts of which it consists rather greater than usual (the price to him not being augmented) under the idea, that it will last the longer, and thus free him for a time from additional charges.

Such, I presume, has been the reasoning that has gradually induced the mechanics of this country to get into the practice of constructing waggon, and rural implements in general, with that unnecessary load of materials which gives them an unwieldy clumsiness that reflects disgrace upon the country which could have so long tolerated them. For my own part, I never see a foreigner (if I conceive him to have an enlightened understanding) looking at one of those implements, that I do not conceive him to be drawing conclusions that make me blush at the idea. It would seem that rural affairs are deemed beneath the notice of men of science here, as they thus abandon them to the most ignorant and illiterate class of men in the kingdom, to do with them whatever seemeth good in their eyes.

I know no set of implements that admit of greater improvement than those of husbandry, on the principle of diminishing weight without in any degree abating strength. Every man knows, that if a beam of any length be made of equal thickness throughout its whole length, and a weight sufficient laid upon it, it will inevitably break in the middle, and never at either of the ends; yet, unless it be in the poles of a

sedan chair, I scarcely recollect an instance in which weight has been diminished upon this principle. On the contrary, it is not at all unusual, in the construction of our implements, to see the thickness diminished nearly one half at the very weakest place by means of a mortoise cut out in it there, while its thickness in other places is four times greater than would enable it to bear an equal burden. No attention is paid to placing the wood in that position wherein it would be best able to resist the pressure to which it must necessarily be subjected; although it is very well known, that the same quantity of materials may be made to bear in one position above *ten* times as much weight as it could do in another. It is well known, that mortises weaken the wood to an astonishing degree when injudiciously placed; yet it is no uncommon thing to see two cross mortises, each of them of twice the size that in any case could have been necessary, made through a beam perhaps at the very weakest part of it, just as accident may direct, without even an attempt to vary their position, far less to avoid them entirely, which in many cases might be done without the least inconvenience. It is well known, that a small brace judiciously applied may greatly augment the strength without adding to the weight; yet contrivances of this kind, which are obvious to the merest tyro in mechanics, seem to be totally disregarded; far less do cartwrights think of adopting new devices of this sort, which a very moderate degree of ingenuity might easily suggest. The importance of having every part firm and compact, in an implement that is subjected to jolts and shaking, is universally recognised; yet, from

the most trifling considerations, we see this principle departed from, and loads of superfluous materials added, in vain, to supply the defects that are thus produced. I might proceed at this rate for pages together; but it is painful to enlarge on things that are self-evident; so that I willingly desist, in the hope that what has been said may provoke some person of spirit to remove the obloquy that thus attaches to the nation at large on this head; for it is not to one implement only that these observations apply, but to almost every common implement of agriculture that I have yet seen which was made in or near London.

I know few better openings for a man of talents in the mechanical line than this would afford; but it is not a talent for gimcrack contrivances, which is usually confounded with a genius for mechanics, though nothing can be more different. It is that kind of clearness of perception which I want, that, disregarding the gewgaws of fancy which are so captivating to *little* minds, looks forward to the great practical rule of effecting the purpose wanted by the most simple, and for that reason the most useful contrivances. The inventor of the common spinning-wheel has been a genius of this sort; an invention which is indeed so simple, that the beauty of it escapes the notice of almost every one who sees it; as was practically evidenced a few years ago by the inventor of that gimcrack apparatus, which was contrived by some mechanic, *a la moderne*, for being fixed to the waistband of those fair ladies who wished to display their fine hands, though, like the lilies of Solomon, they toiled not, neither could they spin. Indeed it would have

required a much greater degree of ingenuity to have taught any one to spin upon it, than seemed to fall to the share of its pretty inventor.

With regard to waggons, and carts employed on a farm, nothing can be more injudicious than this enormous bulk and clumsiness. To consider it merely in point of economy to the owner: let the owner of a stage waggon advert to the profit that he would derive from the abstracting of four or five hundred weight of materials from his waggon (which assuredly, even supposing the present defective system continued, might be easily done); he could in this case carry four or five hundred weight more load for every mile he travelled, without burdening his horses in the smallest degree. Let him compute what the price of the carriage of that additional quantity of goods would amount to in a given time; and he will find that, although the carriage should thus be even considerably weakened, so that he must renew it sooner, he would still be a gainer. But this diminution of weight might certainly be made without weakening it in the smallest degree, so that his saving would be very great by that means.

With regard to carts: nothing surely can be more inconvenient than those high clumsy machines which are seen going along the streets of London every day, nor more injudicious than the manner in which they are dragged. On account of their incommodious height, they can scarcely be loaded without a crane. For the purpose of unloading, two men must be sent with every cart; and the horses must stand a long while idle, during the time both of loading and un-

loading; which, with a lighter, handier implement, might have been effected with ease in a very short space of time, and thus more work expedited. On account of the weight of the carriage, rather than the weight of the load, it has become the practice to yoke three horses in each of these carts: now, not to dwell upon the impossibility of making three horses, thus yoked, exert themselves equally in any situation for a continuance of time, it may be observed, that no situation could be conceived more unfavourable for that purpose than the streets of London; those especially that are near the wharfs, which being narrow, with frequent short turnings, it becomes impossible for the two fore horses to be of any service at the most trying pulls, which are at the turnings, where the shaft horse must pull the whole; and not only so, but, from the carelessness or ignorance of the driver, he must at the same time counteract the force of the other horses, who sometimes nearly draw him on his side, while he is struggling against them to draw the cart forward in its proper direction. He who can behold this barbarous struggle without emotion, must either want the knowledge or the feelings of a man.

As to the carts used for cleaning the streets, though the persons who fill them deserve applause for their dexterity, either they or those who employ them are entitled to but little credit for their ingenuity. The carts are raised so high, as to make it impossible, even with their admitted dexterity, to avoid at all times bespattering the passengers as they go along; and, as if the enormous weight of the cart itself were not a sufficient load, they add to it by a coating of mud some-

times nearly two inches thick, which it gradually acquires by drying as they fill it, and which the drivers seem to think it would be sacrilege to take away till it falls off itself by its own accumulating weight, after having travelled many times backward and forward, presenting a most delicate incrustation to those who have the pleasure of beholding it.

With respect to the operations on a farm, the inconvenience and loss that result from the use of such clumsy implements are still greater, if possible, than those above stated. In consequence of the great height of the wheels which are universally adopted, the naves, and spokes, and fellows, must all be made of such massive materials in order to render them moderately strong, as not only to add a prodigious unnecessary load to the horses, but greatly to enhance the price of such implements, which takes away a great part of that capital which might be otherwise employed to purposes infinitely more beneficial to the public, as well as to the owner himself. From the same circumstance, the difficulty of loading the cart (with dung we shall suppose) is so much increased, as at least to double the expence that it might have been. On account of the number of horses necessary to drag these weighty incumbrances, a farmer has only one of these, instead of three or four that he might have with the same force of beasts, were they upon a proper construction. If in these circumstances he were to hire labourers to fill the cart with a sufficient degree of celerity, they must remain idle the whole time that the carriage is taken up in going to and returning from the field, and unloading there. This subjects the

owner to a very heavy and unnecessary expence, super-added to the evil that results from introducing a habit of idleness among labourers while they should be at work, which will soon come to be universal. To avoid this evil, he usually falls into another, which is perhaps the greater of the two. In many cases, one man only is set to fill the cart, or two at most, so that the horses are allowed to stand idle for many hours together during each day, when they should be at work. This induces a want of economy which would quickly ruin any farmer who paid an adequate rent for his farm. At length, however, the carriage is loaded and brought upon the field, which, if the ground is not in a state of impenetrable dryness, it tears up into deep ruts, that, upon a retentive subsoil, will do more harm to the field than all the dung it brings can ever be able to compensate. The sight of such deplorable destruction, to a person who knew the full meaning of the phrase *a well-dressed field*, would produce a sensation somewhat of the same kind with that he would feel at seeing the flesh torn from the bones of a living animal; and to which he would *on no account* submit, were he even, in order to avoid it, to be obliged to carry the dung upon his own back to the fields. But this is a language that cannot be understood by those who have been accustomed from their infancy to look on such proceedings with indifference; no more than the butcher can feel the force of the innocent look of the lamb when he is about to plunge the knife into its throat.

To a man who deserves the name of a *farmer*, the *lightness* of a carriage that is to go upon his land is a quality of the first importance; and he would give

more to the man who should diminish a stone in its weight, and at the same time render it more commodious in use, than for any additional strength. Were no other benefit to result from the use of light carriages for operations on the farm, this would be sufficient. But when it is also considered, that by their means, with the same strength of beasts of draught, more than *four times* the quantity of work may be expedited in the same time, while not one minute's time will be lost by labourers, the practice of employing such faulty implements as those now in general use will be deemed a practical barbarism most enormously absurd.

But if the use of unwieldy *carts* upon a farm is an absurdity deserving reprehension, that of *waggon* for farm purposes is still more reprehensible. To see a waggon with four horses go into a field not above two minutes walk from the home-stead, there to be detained two hours at least before it can be loaded, in gathering in corn; then tearing up the ground as deep as the plough reached, on its way home; and then returning after two hours more to take up another load, I should have called the *ne plus ultra* of absurdity, had I not seen the same team, with all its horses yoked, employed afterwards to carry the same corn from the rick into the barn (a distance not exceeding fifty yards). This I actually did see; and I am sure, that in those who have never beheld things of a similar kind, it will require a great stretch of faith to believe that I do not here avail myself of the privilege of a traveller. Many of my readers, however, will think nothing of it.

In regard to the leading home of corn, the fact is, that

112 *On the Construction of Waggon and Carts.*

by means of a proper set of carriages, and a judicious arrangement of particulars in other respects, more corn might be housed in one day, under the circumstances stated above, by the aid of the same number of horses, than could be done in a week by the usual method; to those who consider the precariousness of this climate, it is scarcely necessary to say, that the benefits which would result from such arrangements no man can fairly estimate.

If in this essay I have assumed a sarcastic mode of stating facts, which may to some appear harsh and irritating, let it not be imagined that this proceeds from a desire to indulge a splenetic humour. It is merely intended to *provoke* discussion. If any one shall feel his pride roused by any expressions that have been here used, I wish him by no means to repress it; let him indulge it so far, as never to rest satisfied till he has made himself fully master of the facts that are necessary to refute them: and, when he has got these cut and dry, so as to stand the test of the nicest scrutiny, let him silence this bold intruder, by overwhelming him at once with their whole accumulated weight. Thus he will be completely revenged, and obtain that entire satisfaction which every one who thinks he has sustained an injury has a right to expect.

In a future dissertation, I shall endeavour to show by what other contrivances it is possible to diminish the number of horses to a *much* greater amount than the alteration above suggested would occasion.

NATURAL HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

[Continued from page 36.]

On the habits and peculiarities of the rat-tailed larva of certain flies, and the changes they undergo.

MY readers must now know, that every insect may be considered as two distinct animals when it is separately viewed in its larva or perfect state, independant of that intermediate period between life and death which it passes as a chrysalis or nymph. Indeed, the principal operations of most insects are performed while in their larva state, and as such chiefly they are known to man as a noxious ravager, and principal destroyer of those things that are held in estimation by him. Hence it is, that although, for the sake of classification, it be necessary to discriminate them when in their state of perfection, and though, on account of their beauty then, they often attract his regard, yet, for economical purposes, it will be found, that the history of them in their larva state will at all times constitute the most important department in the science of Entomology.

In the early æra of this study, the connexion between the larva and its parent could be very seldom traced; nor was it then suspected, that these were in all cases so distinct from each other as is now demonstrated to be the fact. Hence it happened, that many creatures belonging to this class were described as distinct and perfect animals, while they were merely in

their imperfect larva state. These larva were then arranged into classes, according to their similarity of appearance and congeniality of habits, many of which are now found not to correspond exactly with those classes that Linnæus has established, which are all founded on the characteristics of the parent insect. Of this sort are the objects that demand our attention in the present Recreation; for, although most of the soft rat-tailed insects be the larva of a certain class of flies, yet this rule does not universally apply. As the characteristical habits, however, of all the larva of this kind are nearly the same, I have judged it proper to view them as thus classed on the present occasion.

The creatures which constitute this class are usually discovered in moist places, such as are frequented by the common black lizard, crawling on the earth slowly with a movement not of the vermicular kind, nor resembling that of any other well-known creature. They have no feet that are apparent like those of the lizard, though it is found, upon a very narrow examination, that they have seven pair of legs on the under part of the body, which they can occasionally employ, yet these are so short, as to be in no case easily cognisable by the eye, but on many occasions are entirely imperceptible, this creature being endowed with the singular faculty of withdrawing them occasionally entirely within its body, so as to be quite beyond the view of the keenest observer. In its general form, this insect approaches to that of the newt or tadpole; the fore part being soft, thick, and rounded; and the tail small and tapering; but the tail has none of that serpentine movement which discriminates that of the young frog.

The colour of this insect, when found in the situation now described, is various, as it participates of the nature of the mud or dirt through which it has crawled, the body being endowed with the property of throwing out a viscid liquor, that makes such small solid bodies as it chances to touch adhere to it; so that it is covered with a crust of dirt, often of the sort which is most nauseous to man (one of the most common kinds delighting to frequent the neighbourhood of jakes): before its real colour can be seen, therefore, the creature must be washed in pure water, when it will prove to be a native transparent white. Being thus found, it is often mistaken for a creeping reptile which draws its subsistence from the earth; but in truth it is a real aquatic insect. It lives in water only; and, during the whole period of its growth, and so long as it requires food in its larva state, it draws the whole of its nourishment from that element, which it never leaves, until it approaches to that state when it is about to undergo its great change and assume its pupa form; and then only in quest of a convenient place in which that great change may be finally effected.

The parent fly, when it is about to lay its eggs, directed by that unerring instinct which is so eminently conspicuous in all the operations of the insect tribe, chooses a place between moist and dry in the near vicinity of water, where it deposits them with the most cautious attention. Mr. Reaumur, after having ascertained the kind of fly that produces this insect, watched the motions of one of them that he saw flying about a bucket of water which stood in his garden, where he suspected it meant to deposit its eggs. The

surface of the water was about nine inches from the top of the bucket at the time. The fly, after crossing it and returning several times, at length descended within the mouth of the bucket, and, after flying round and round it several times near the surface of the water, alighted on the side of the bucket, and, searching around, stopped for some time at one place about an inch above the surface of the water, whence, after several movements that indicated how she was employed at the time, she went to another place, and, having rested for some time there in a similar manner, removed to another; and so on to several successively; and then flew away.

Our attentive observer now went to examine the places where she had stopped; at each of which he found, adhering to the vessel by means of a kind of glue with which the new laid eggs of insects are generally covered, a cluster of eggs amounting to forty or fifty in number. He observed, that in all those places the wood was just damp, from the influence of the water below, but not wet; and that she had chosen, by preference, the cavity between two joining staves, where that moisture was less likely to be dried up from accidental causes than elsewhere. In that situation, the young insect could no sooner be extruded from the egg than it found itself within reach of that element in which it was destined to pass the most considerable part of its life, and where alone it could find that kind of food adapted to its nature. Can any one who contemplates these things really persuade himself, that without the aid of a superintending Providence continually exerted for the preservation of the

universe, this silly insect could have been directed with such unerring wisdom to choose the place that was best fitted to preserve the life and provide for the wants of that progeny which it was itself doomed perhaps never to behold!

The young fry is no sooner dropped into the water, than, like all other animals in their natural element, it finds itself endowed with the instinct of searching for its own food, and of employing in an appropriate manner all the members of its body to the proper uses for which they are naturally adapted: and some of those members in this instance are so different from what man is accustomed to see employed for similar purposes among other animals, that we cannot wonder if it was some time before he came to satisfy himself of the true nature and uses of these organs.

The tail of this insect is an organ, which, when it is observed as a terrestrial animal, appears to be so inconvenient, and so little adapted to any useful purposes, that Gœdart and many other naturalists had exercised their talents in vain to try if they could discover how it could be of any use to the creature; and the ingenious conjectures which they made on that head can now only excite a smile, though they afford a lesson of caution that ought never to be lost sight of. It is now fully proved, that in this insect the tail is the organ of respiration. That though it indeed lives in the water like the whale, it is in fact, like that whale also, a breathing animal, which would be entirely suffocated and drowned, as men and whales are, were it to be continued under water, and excluded from all access to the air for a longer time than is ne-

cessary for one of those expirations. It seems indeed, in this respect, more nearly to resemble man and other terrestrial animals, than the whale and others of the amphibious kind; for it can subsist but for a very short time, without a direct communication with the air.

The seal, and other amphibiae that breathe as man does by the mouth, are, it is well known, endowed with a particular arrangement of internal organs, by means of which the vital functions can be carried on in them for a considerable time without any direct communication with the air by breathing: nor can we assign a reason why this insect has not been endowed with a similar set of organs, any more than why it should live among water, and find its food among the mud at its bottom; but that it has been the will of the Creator so to ordain it; and that, by the same almighty FIAT, it has been decreed, that this insect should derive its necessary supply of air by means of the tail, in place of the more common mode of supply among larger animals by means of the mouth. All that we can do is, to ascertain by undeniable experiments that this is the fact, and to observe the curious apparatus that nature has provided for enabling that organ to perform these functions without deranging the other necessary operations of this little reptile.

Whatever be the nature of its food, it seems certain, that it finds this in greater abundance among the mud and sediment that falls to the bottom than it can do any where else, especially if the water be much impregnated with the decayed parts of vegetables and other putrid matter. Its mouth being placed at the

end of its body opposite to its tail, this creature is found to delight in searching among the mud with its head, as a hog routs the earth with its nose; and hence it has been called by Gœdart *vermiculus porcinus*, hog worm; and in order, as it should seem, that these operations may not be interrupted by the necessary function of breathing, the tail is in the mean while stretched up to the surface of the water, where it communicates freely with the air, and the animal below is allowed to enjoy itself with perfect freedom.

But as it cannot happen, that any pool of water shall remain always at one depth, it must have frequently occurred, that the creature might have been deprived of the means of subsistence by an accidental rising of its surface, had no provision been made for this case. To guard against such an evil, it is endowed with the singular faculty of lengthening or of shortening its tail, within certain limits, as the necessity of the case shall require, like the flower stalks of those aquatic plants whose flowers can only expand properly, and impregnate the seeds, upon the surface of the water, which so expand and contract themselves as always at those times to reach the surface of the water and no more. Exactly such is the case with the tail of this singular insect, which can be so far lengthened as to give it a very extensive range of pasture (if we may adopt that phrase), but its limits are assigned.

Messrs. Reaumur and Bonnet, of Geneva, were, I believe, the first who discovered the real uses of this singular organ; and Mr. Reaumur was at the pains to ascertain the maximum length to which the tail of that species whereto I shall confine myself in this dis-

quisition can be made to extend. He found, that an insect whose body measured only seven lines (little more than half an inch) could reach the bottom with its head when the water was sixteen inches deep; but when it exceeded sixteen inches and a half, it could no longer reach the bottom without immersing the point of its tail in the water; and there, of course, it could not abide. Thus it appears, that the tail, when stretched to its whole length, measures more than thirty times the length of the body. We shall see by and by in what manner it can dispose of its tail, so as to live in any depth of water short of this. It is certain, that this insect is never found in pools that are uniformly of a greater depth; and it chiefly delights in shallow puddles.

Upon the slightest inspection it is observable, that the tail consists of two parts; one thicker, *qs*, Fig. 2 (p. 126), which is next to the body, the other smaller, *sr*, which issues from that, as if from a sheath, into which it can be wholly drawn at pleasure. Both these parts are so flexible as to admit of being bent from side to side at pleasure, and both of them also are expansile or contractile; that is to say, not only can the smaller piece be pushed out of its sheath to a certain length, like the sting of a bee, or the slider in a measuring scale, without suffering any diminution of thickness, but they can both be farther extended, like an elastic thread, or like a shred of elastic coutchouc, diminishing still in thickness as they increase in length; so that when this organ is extended to its full length, it is not thicker than a hair.

The skin of this insect is so transparent when it is

immersed in clear water, as to have enabled Mr. Beau-
mur to remark the form of the trachæ or air vessels in
the body, through the skin, and the changes they un-
dergo in consequence of the extension or contraction
of this organ. These air vessels are two. In the
thickest part of the body they are of considerable mag-
nitude, but rapidly contract towards the head, where
they are lost. Towards the tail they become gradually
smaller; in the tail, when it is stretched to a moderate
length, they can be seen running along the whole of
its length like two parallel stripes; but when at its full
stretch, they become imperceptible. As the tail con-
tracts, and is drawn within its sheath, these vessels at
first become only thicker and more perceptible, but
bye and bye they are seen to bend up in folds near the
hinder part of the body; and when it is in its shortest
state, they assume a contorted appearance similar to
that which is discoverable in the small gut of quadru-
ped. The alimentary canal is plainly distinguishable
from these by the darker colour of its contents.

To give a clear idea of the habits of this insect, I
represent at Fig. 1. a glass vessel full of water, with a
quantity of mud at one of its sides gradually rising
upwards, so as to make it shallower at one side than
the other. *a* represents one with its tail stretched to
its whole length, and unable to reach the bottom. The
others are enjoying themselves in the various attitudes
that are most common with them. Fig. 2. is the same
insect represented more distinctly, *a* the mouth, *q r*
the tail.

The tail terminates in a small point not perceptible
by the naked eye. At the bottom of this filament

(which appears to the naked eye to be the point of the tail) by the help of a good lens, are discovered five filamentous hairs, which spread out as radii round it, and lie flat upon the surface of the water.

In this state it lives in the water a considerable time (some months, but how long is not precisely ascertained), until it has attained its full size, and probably has cast its skin several times. But when the period arrives at which it is about to change, like other insects in the same state, it begins to nauseate the food wherein it hitherto delighted, and, abandoning the element in which it hath lived till this time, it searches for a more suitable place of rest, as has been already said; in which it may undergo its final metamorphosis, and respecting which some peculiarities occur, that we have not had occasion to observe among those whereof mention has already been made.

This creature, it has been shown, cannot in strict propriety be called an aquatic, but rather an amphibious insect; a kind of amphibious animals, however, that may be said to constitute a new order which has nothing, that I know of, similar to it in nature. Like other amphibiæ, it searches for its food under water, in which it lives continually without being under any necessity of ever raising its body to the surface; but it never has its communication with the external air interrupted. It may be compared to a man under water in a peculiar kind of diving apparatus that has been contrived, but never found reducible to practice, to whom fresh supplies of air are continually admitted through a pipe that communicates with his mouth; but man has not yet been able to contrive a

pipe of such a perfect construction as that with which nature has furnished this insect. It would seem indeed, that, like most other amphibiae, this little reptile could live perfectly well on dry land as long as it could subsist for want of food, were its skin properly moistened to prevent it from becoming hard and unpliable, so that, when it should leave the water, it might suffer no other inconvenience than those here stated.

Having found a suitable place, it remains at rest, without attempting to construct any kind of cocoon, or nest, to protect it, as most other insects do: its own skin is destined to perform that office. The body is now observed to contract considerably in length, while it augments in thickness; the tail shrinks in its dimensions, and becomes hard and rigid; the skin itself, after a short time, from being a soft membranaceous substance, is converted into a shell-like coating: nor do the changes stop here; the head loses its pristine figure, and in a little time are seen the rudiments of two pairs of horns bursting the former skin: these soon attain their fullest size, when the lower set, which are short, proceed nearly forward with a small curvature upward; but the higher set, which are longer, first rise upward, then push forward, and at last gradually bend downward. At this period it appears as at Fig. 3. The whole creature now bears no small resemblance to a rat without its legs. This double set of horns Mr. Reaumur found was an entirely new set of organs, that did not at all exist in the worm state, and have no vestiges remaining in the fly, into which it is soon to be transformed; so that they are solely appropriated to this insect while it remains in its

nymph state. This circumstance is so unusual, that it induced our attentive naturalist to make a very careful investigation of the functions that they are destined to perform, which he found was nothing else than to serve the purpose of spiracles, or air organs, to the Nymph. The tail is at this time entirely detached from the Nymph; it is rigid and void, and there is no opening from the body that can communicate with it.

This set of organs however, which have been so lately produced, are doomed to have only a very short existence; in little more than twenty-four hours from the time these have attained their proper shape, the members of the inclosed Nymph are found to be completely formed, and in about ten days more the whole are hardened, and the fly, having acquired vigour, bursts the head part of this casing asunder, when it opens in two pieces, to one of which adhere the small, and to the other the large pair of horns, when it issues forth in the perfect form of the fly A, which soon finds a mate, and makes preparation for producing a new progeny.

As if the singularities of this insect were without end, we have to specify one other peculiarity affecting it (observed by Reaumur), that has no parallel that I know of, if indeed it be not a mistake in that great naturalist; yet he speaks of it with absolute certainty, as far as one observation could permit him to go. In bursting open the fore part of the Nymph case to permit the fly to escape from its prison, he supposed, as happens with other soft insects like this, that the fracture was occasioned by alternate contractions and swellings of the *head* of the contained fly struggling for free-

dom; but, to his surprise, he observed in one instance, on opening the case of the Nymph when he saw it ready to be burst, that it was not the *head* but the *hinder part* of this fly that was employed for that purpose; and on taking out the fly itself with a view to observe whether its head admitted of similar swellings and contractions as commonly occur in cases of this sort, he could perceive nothing of that sort in it. He hence concludes, that this fly turns itself in its case, being obliged to do so from this singularity in its construction; though he confesses, that, on account of the straitness of its covering, it is difficult to conceive how that change of position could be effected. For my own part, I should be inclined to suspend my judgment in this case till it were confirmed by farther observations, though, in deference to such a justly respected observer, I do not think myself authorised to suppress his statement of it.

The fly A is one of the smallest that has hitherto been observed to proceed from the rat-tailed class of insects. Although it has only two wings, and is smaller in size than the bee, it has so much of the general appearance of that insect (although that has four wings) as only to be distinguishable from it by a very narrow inspection. The corcelet of this fly is of a greyish colour, and is covered with short hairs; the rings of its body are of a velvety black; upon each side of the first ring (that which joins to the corcelet) is a triangular mark of a pale yellow colour; and three of these rings are bordered with a yellowish white. This is the *musca apiformis* of Ray. Linnæus gives it the following long name, *musca fusca segmentis abdomi-*

nalibus tribus margine albidis, primo latere flavo, thorace vix maculato. Faun. Succ. 1084.



Fig. 3.



Fig. 1.

Fig. 2.



The fly which produces the rat-tailed larva that frequent privies is of a much larger size, and is represented at B. Its corcelet is covered with red hairs; hairs of the same colour border its rings, but these are more shining, and of a deeper brown; there are also some scattered hairs even on the rings. The under part of the belly is lighter than the upper part of the body. This is the *musca hirsuta grisea, alis punctato obscuro*, Linn.

Another sort of fly of a middle size between these two, C, derives its origin from a rat-tailed worm of the same

sort. There is no danger of confounding this fly with a bee. The base of its colour is a fine yellow: upon this yellow runs a broad stripe of black in a straight line from the first to the last. From this black stripe run from ring to ring large marks of the same in segments of circles. The corcelet is of the same black with the rest of the body; and there are four yellow strokes upon this, directed according to the length of the body.

MISCELLANEOUS LITERATURE.

On the comparative influence of agriculture and manufactures upon the morals and happiness of a people, and the improvement and stability of states.

IN compliance with the request of my sensible correspondent, *A Country Parson*, page 37, and of several others who have expressed a similar wish, I have resolved to appropriate a part of this work to the investigation of the subject above enounced. It is a subject which at all times ought to be deemed of importance, but which claims our attention in a special degree at the present time, when the body politic seems to be out of order, and evils that result from thence have risen to such a height as to demand the best exertions of every one to mitigate them, if possible, before they shall have risen to such a height as to resist the power of lenitives to check their pernicious influences. With this view I willingly engage in this dis-

quisition, which shall be conducted in that cool and dispassionate manner which is so becoming in the discussion of every question of such serious concern as the present. In this case I satisfy myself that it shall be done with the greater impartiality, and without being influenced by local circumstances, or the feelings of the day, seeing the first part of this essay at least was written several years ago, so that I shall do little more now than to transcribe it.

The most obvious consideration that occurs, when agriculture and manufactures are considered as affecting each other, is, that manufacturers, by becoming purchasers of the produce of the fields, offer encouragement to agriculture; and that, of course, the greater the number of manufacturers there are in any country, the more prosperous will the agriculture of that country be.

There is, however, a fallacy in this reasoning; and unless several circumstances are attended to, and guarded against, the conclusions here drawn may be very unjust. In many situations a great part of the subsistence of manufacturers may be drawn from foreign parts; and where that is the case, the agriculture of the country is not encouraged in proportion to the prosperity of its manufactures. If laws are injudiciously made, so as to cramp the operations of agriculture, the prosperity of manufactures may even, in some circumstances, retard the progress of agriculture; for, by raising the wages of servants, it diminishes the farmer's profit; who finding greater returns for money and attention in prosecuting manufactures than in cultivating ground, the capitals of the most enterprising

individuals will be withdrawn from rural operations, and vested in manufactures; and, with the general poverty of the tenants, the progress of improvements by them must be greatly retarded.

The argument above stated is fallacious in still another point of view. Manufactures can only augment the demand from the farmer, in consequence of augmenting the total numbers of the people. If, for example, one thousand persons are employed in agriculture, they will require just as much food as if five hundred of these were employed in manufactures and five hundred in agriculture. There will therefore in this case be the same encouragement to agriculture with or without manufactures. It may occasion, however, a considerable difference to individuals, and the consequences to the state may be, in the end, extremely dissimilar.

It is the *free* produce of a farm alone that constitutes the farmer's profit, not the *gross* produce; whatever, therefore, tends to augment the proportion of *free* produce on a farm, will, in the first instance, tend to augment the farmer's profit, and consequently the amount of rent he can afford to pay for his farm, even if the *gross* produce of it should be thereby diminished. If, for example, with the labour of ten servants, and proportional horses, he can produce a thousand quarters of grain of gross produce, and if the expence of each servant and his appurtenances be equal to twenty quarters, he will thus expend two hundred quarters out of the thousand. If two hundred also shall be required for seed, he will have only six hundred left. The tithe will in this case be one hundred quarters,

so that he has only five hundred remaining for paying rent, poor's rates, and all other charges. But say, that by another mode of management the same value of produce could be reared by the help of five servants, then he would expend on *them* only one hundred quarters; and, if all other expences were the same, he will have an additional profit equal to the price of one hundred quarters: so that, whatever be the consequences to the nation at large, he finds it greatly his interest to diminish the *people* on his farm.

But the farmer in this case would be a gainer, although its produce were considerably less than before. If it even reaches to nine hundred quarters he will be no loser, though the gross produce was diminished by one tenth, and of course the people who ought to be supported by that hundred quarters will be left destitute of food; and if, in consequence of that short produce of corn, the price of it should be raised, he will be actually a gainer by that change.

Nor has he occasion to stop here. If he can draw nearly as much money for the produce of his land when in grass as while in corn, he will be able to reduce his expences yet more. Instead of ten servants that were required at first, he finds that *one* only will be required when in grass; his profit therefore will be augmented by throwing it into grass, and he does so, and becomes more wealthy, or, what is the same thing, can afford to pay a higher rent in consequence of that change. Agriculture appears thus to flourish, and farmers get wealthy; but what is the effect that this change produces on the community at large? The quantity of human sustenance now produced upon the

same land being in grass will not, on an average, amount to the fourth part of what it would have produced while under tillage; a deficiency of food for the people therefore must now be experienced, although their numbers, instead of augmenting, should have been actually diminished.

The demand, therefore, for the produce of agriculture, by manufacturers, may be only apparent; and the farmer by diminishing his labourers, may have more free produce, while the actual gross produce of the country has been diminished; so that both these striking proofs of the prosperity of a country may be fallacious.

To the philosophical statesman, the number of the active citizens which can be supported in the state, affords the truest criterion of its power; but, like numbers in an army, he knows that, unless measures can be devised for giving them a constant supply of food, and enabling them to find the means of obtaining that food at all times, they will be apt to be thrown into the most fatal disorders. It becomes a great object of his attention, therefore, to guard against these disorders, in the same manner as it requires the greatest exertions in a skilful general to provide stores and forage for his army at all times.

From these considerations, disregarding the accidental profits that may accrue to individuals from particular considerations, he will only consider the general effect that is to be derived to the whole community from such an arrangement. Hence he will naturally say, since, in consequence of particular arrangements, the same number of people may be subsisted in the

country by following agriculture chiefly as a business, or by engaging in manufactures, it is his duty to consider whether the happiness of the people and the tranquillity of the state, would be most promoted by inducing them to pursue the one or the other of these modes of life; supposing it were in his power. This is the question I wish to investigate at present.

There is one very striking difference that must occur to every one who views the same number of persons as employed in agriculture, or in manufactures, viz. the great fluctuation in the earnings of the people, in the last class, in comparison of those in the other. Manufactures are subjected to great variations in the demand at market. Sometimes the orders for those of one sort are so great, that the highest exertions are required for supplying that demand. During this period every thing assumes the most inviting appearance. The master manufacturers have it in their power to enhance the price or diminish the quality. Their profits are great. Every one is anxious to obtain as great a share as possible in this gainful business; he tries to obtain as many hands as possible; journeymen, of course, become scarce, and obtain higher wages; this induces more persons to enter into that business. All is life and bustle; and smiling prosperity brightens every countenance. The lower classes of the people are enabled to pick and cull the nicest viands; for rearing which the farmer gets great prices, so as to enable him to abandon more common articles of produce. But in a short time a change of fashion,—such a trifle as a shoe-string being adopted in place of a buckle, or a clasp instead of a button, makes a

total stagnation in this once flourishing business. The master manufacturers, finding no more demand for their goods, cannot keep their journeymen longer; and, as these in general work by piece-work, it costs him but a word to discharge one or two hundred persons; who are thus thrown at once out of employment, and consequently experience the greatest distress, till they can find some other means of subsistence. The luxuries which the farmer used to rear for their use are now allowed to remain upon hand. He, depending on these sales, is reduced also to distress; and complaints are loud and universal. No such changes can ever be experienced by men who follow agriculture. Neither the encouragement, nor the discouragement, are nearly so great. So that this political malady, which is one of the severest that can affect a state, is never experienced.

Other evils that are the consequences of it, are equally guarded against. Men, in the lower ranks of life, when they are enabled to earn more wages than is necessary to subsist themselves in the way they have been accustomed to live, usually become idle and dissipated; they spend their superfluous earnings in drunkenness and debauchery. One person seduces another; —their morals become corrupted, and their manners irregular. Persons of this description are, of all others, the worst to manage in a state. While they enjoy the sunshine of prosperity, they are disorderly; when they experience difficulties, they become riotous and factious. Ever ready to run into extremes, they become the willing tool of every desperate man who wishes to raise disturbances in the state. A Catiline

has only to appear, and he finds them ready for his purpose. Such persons are, of all others, the most unfit to bear those checks and reverses of fortune to which manufacturers must ever be subjected. Hence it happens, that manufacturing towns become such fertile nurseries of mobs, tumults, thefts, robberies, and every species of depredation. These dissipated persons become a charge on the parish, or they go to the highway or the gallows.

Such excesses are never experienced in rural situations, where men follow the peaceable employment of agriculture. Their labour is constant and equal;—they are never overdone, and never idle;—their sustenance is equally certain, uniform, and moderate;—they do not associate together in such numbers, and are, by consequence, less liable to be seduced by the contagion of bad example. Being actively employed in the fields during the whole week, Sunday becomes a day of rest; and divine service is to them a pleasing exercise. Every mind that is not corrupted by vicious habits is fond of being informed. On this principle they become interested in the duties of religion, and attentive to the discourses of their pastors. In short, it is scarcely possible for a person who has not had access to behold it nearly, to form an idea of the immense difference that there is between the innocent simplicity of heart of the inhabitants of the country, compared with the irreligion and immorality of the lower classes of people in towns. I hence conclude, that a state which contains a given number of people, chiefly employed in agriculture, affords to the natives a greater share of domestic happiness, and is

infinitely more stable, less subject to distress arising from tumults and disorders of every sort, than one where manufactures furnish the chief employment of the people.

From the same considerations, I agree with the sensible correspondent above referred to, in thinking, that when a state becomes intoxicated by extraordinary success in manufactures, it is in a very ticklish situation indeed: and that in proportion to the uncommon flow of prosperity in that department, which accidental circumstances may confer upon it, the greater room there is to fear that its prosperity approaches towards a crisis. Were it even possible to guard against a check in the demand, the dangers to be dreaded from a long flow of prosperity are little short of those that result from a sudden slackening of business: for nations, like individuals, wax wanton with prosperity, and run into excesses which necessarily produce their ruin.

Not only is the present tranquillity of the state, and the happiness of the people less, if manufactures be the chief employment of the people, than agriculture: but the probability of its future advancement in point of population and general industry, is much diminished.

From what has been already said, it is evident, that when great wealth is acquired by a temporary demand for manufactures, the farmer finds it his interest, in the first place, to diminish, as much as possible, the number of hands he employs, although, by doing so, he be certain of diminishing the total produce of his farm; and in the next place, by getting a high price for meat and delicacies, he finds it his interest to rear

a much greater proportion of animals, and less corn, than formerly. But as a field under judicious culture will, in all cases, produce a much greater quantity of human sustenance, than when employed in rearing animals; it happens, that in this way the total amount of human sustenance, raised in the country, may be prodigiously diminished; while agriculture, on a superficial view, seems to be in a more thriving state than before: that is, while the farmer lives better, and pays more rent than formerly.

In this way we are easily enabled to solve a difficulty that has much puzzled some of our legislators for several years past to account for, viz. to reconcile the idea of the prosperous state of agriculture in this country, for some years past, to the facts they discovered, that the actual produce of the country in corn had been, during that period, considerably diminished.

After this manner does an undue demand for manufactures necessarily induce a kind of temporary prosperity which excites a spirit of wantonness that tends to sap the foundations of the stable prosperity of a state. The *first* consequence of this extraordinary spirit is wealth to all. The *next* is the deterioration of the soil; for I call every thing a deterioration that diminishes the gross produce of the fields. A *third* consequence is the diminution of labour; for, when men can earn much more than will furnish for their daily subsistence, they abandon their work at pleasure; a consequence of this is a want of hands, and an increase of wages in every case. A rise in the price of every article of necessary consumption is then unavoidable. Hence, at present, the rise in the price of

grain, so severely felt in every part of this country. These things may continue for a time to be felt, and complained of as a hardship; but so long as the demand for manufactures continues brisk, these inconveniencies can be borne. But if ever a permanent slackening in that demand should take place, the consequences would be dreadful.—Men, who had been used to fare luxuriously, being turned out of employment, would find it a matter of the utmost difficulty to subsist in any other way;—the farmer who found a slackening demand for the articles he used to rear, and on which he made his rent, would be compelled to reduce the price below what he could afford. The consequences might be traced minutely; but it is an ungracious task. They are too obvious.

I conclude, that the prosperity which results from an extraordinary demand for manufactures is a political disease of the most dangerous tendency. It is a poison that produces a pleasing delirium, which, like that from opium, must end in a miserable death. Sober minded persons, therefore, will look upon this general intoxication without participating in the phrenzy it produces; and will regret that circumstances should here so unfortunately concur to cherish it.

[To be continued.]

Hints respecting Taste.

A CORRESPONDENT who assumes the name of *Hafex* is very importunate with me to give an essay on taste; and, in particular, is extremely anxious to have a definition of that word; for which, he says, he

has searched all the dictionaries and Encyclopædias that have fallen in his way, without meeting with any thing that was satisfactory to him. He must think me a very singular person indeed, if he conceives that I can be able to supply all the deficiencies in those dictionaries and Encyclopædias that are in common circulation: nor could he, perhaps, have fixed on a word that is in general and common use among all classes of men, which would be more difficult to explain in a satisfactory manner, than that on which he hath fixed. Of this truth he will be satisfied when I tell him, that there have been written within the present century no less than four essays on taste, all by men of talents (and three of them men who have been ranked by the concurrent voice of all Europe among the first-rate geniuses of their age); these were, Montesquieu, the celebrated author of the Spirit of Laws, Persian Letters, &c.; Voltaire; D'Alembert, of the French academy; and Dr. Gerard, of Aberdeen. To these essays, which are all on sale, and I suppose may be had separately, I beg leave to refer this correspondent, who, indeed, seems to hint as if he had read them without receiving the satisfaction he wished to obtain. There are numerous other speculations on taste scattered among the works of philological writers, but to which I cannot at the present moment specifically refer.

I shall, however, beg leave to suggest to this correspondent a circumstance which may, perhaps, have escaped his notice; and which, if duly adverted to, may possibly assist him in his researches: it is, indeed, suggested by the tenor of his own letter. He does not

seem to be aware, that there are some objects which do not admit of being defined in such a manner as to convey a clear and discriminative idea of them to any person whatever; and there are others which, though they do admit of being accurately defined, yet those definitions, though they should be precise and discriminative to one person, may be totally incomprehensible by another who has equal vigour of mind with the former, and perhaps superior talents. It is not impossible but my correspondent may be of that number, though, from his manner of writing, I should scarcely suspect it. That he may be able to discover this himself, I shall try if I can explain these two peculiarities by a few familiar illustrations.

Supposing I were to attempt to define the word colour: I believe I might say, "*Colour* is that peculiarity affecting bodies by which they can be discriminated from each other by the eye, without any diversity of size, shape, proportions, consistence, or arrangement of parts. This might do for the word *colour* in its general acceptation; but when you come to particular colours, and try to define them, you will soon perceive that it cannot be done. "Blue," Dr. Johnson says, "is one of the primary colours." This is by no means satisfactory; but how can it be rendered more so? Only by likening it to some well-known natural object, such as a corn bottle — *Pink*, a colour resembling the rose — *Red*, the colour of blood — *Yellow*, the colour of gold — and so on. Now it is plain, that none of these are definitions; for, if I had never seen a corn-bottle, a rose, blood, or gold, they could convey no sort of idea to my mind; it is a mere comparison only, and nothing

more: nor could a philosopher, were he for twenty years to study a definition, contrive by any other way to convey to the mind a discriminative idea of things of this nature.

Nor is it in regard to colours only that we must have recourse to comparison instead of definition: the same thing applies to tastes, smells, sounds, and every thing else that is cognisable only by the help of the external senses. We say, that such a thing has the smell of a rose, the taste of a cucumber, the sound of a drum, feels like velvet, or looks like a man, &c. All such objects, then, are wholly undefinable by any other method than that of mere comparison.

The reader will now easily perceive by what means a definition may be just, yet may be totally incomprehensible by a man whose mental talents are of the first degree of brilliancy. If he be blind, for example, how can I convey to his mind the idea of the colour of a rose, of blood, or gold, or any thing else? The definition of colour, as above given, may be perfectly just; but, as he has not the use of that organ by which it can be discriminated, it can convey no definite idea to his mind. When such a man hears others speak of colours, he may form some notion in his own mind, which will be recalled when these objects are mentioned; but this must be wholly ideal, like that of the blind man who, being pressed to tell what was his idea of the colour scarlet, "I think," said he, "it is like the sound of a trumpet." Every blind man must have some such idea annexed to the different colours; and, although he may learn to talk of them as fluently as others, yet his notions must ever continue as incongruous as the above.

If my correspondent adverts to this circumstance, it may perhaps enable him to account for many particulars respecting objects of taste that have hitherto appeared to him wholly inexplicable. In order to assist him a little, I shall try if I can give any sort of definite notion of what is generally understood by the word *taste*; for there can be no doubt but that word conveys some idea to every person who uses it; though that would seem to be in general very vague.

Every body knows, that the word *taste* has a two-fold meaning. In the first place, it denotes that sensation which man, and other animals endowed with similar organs, perceives when sapid objects are applied between the tongue and the palate. The pleasure that animals derive from this sensation was, no doubt, conferred upon them by the Creator, to operate as a powerful stimulus to prevent them from ever neglecting to take that food without which they could not subsist. With regard to food, we are able to perceive, that man experiences a two-fold sensation, to serve, as it were, for a double guard, to prevent him from forgetting to take his necessary sustenance: one is a kind of craving of the stomach, as it were, which produces a desire for food of any sort, which we denote by saying, "I am hungry." This operates chiefly as a *stimulus*. The other is the pleasure of the palate only, which is heightened by the powers of the imagination, and may be said to be rather *alluring* than stimulant: and there are persons who are endowed with the one or the other of these propensities in a much higher degree than the generality of men. This is so very obvious, that we have given them different names,

The person who has an inordinate craving for food, we call a *glutton*; while he who has a high relish for the dainties of the palate, is called an *epicure*. To persons who have both these propensities in an ordinary degree only, it often appears perfectly incomprehensible how the others should ever be brought to sacrifice so much as they are often seen to do with a view to gratify those appetites. But these persons are not aware of the high degree of pleasure that the others derive from the indulgence of that appetite which would afford to themselves only a moderate degree of gratification. Thus it is, that the different degrees of acuteness in the sensations derived through the medium of the same set of organs, must occasion an infinite diversity in the perceptions of men, and the judgments they must form of each other, considered even in the light of moral agents. For, if the allurements are but feeble in one, he must esteem those who cannot resist it extremely weak; whereas, if the allurements had been to him exceedingly seductive, he must have deemed the person who could resist it a hero, and he who reluctantly yielded to it as more an object of tenderness and pity than unpardonably blameable. Like Anthony, he could kindly say,

The fault was mine, to place thee there,
Where, only, thou could'st fail.

The second meaning of the word *taste* has been evidently borrowed from the former. It denotes a kind of pleasure similar to the above that is derived rather from mental perceptions than from the palpable operation of the senses. I could not, perhaps, better define this kind of perception, as it strikes my

own mind, than in this way: "Taste," I would say, "is the perception of harmonies or discords in nature or art." But to render this definition intelligible, some explanations, I am aware, will be required; and it is ten to one if, after all, they will prove satisfactory.

There is one remarkable peculiarity in the natural history of man, which seems to have been very much disregarded by those who have entered into investigations of this sort, but which ought not to have been overlooked. It is that singular faculty that he possesses, of experiencing a two-fold sensation through the ministration of one sense only. This I had occasion slightly to notice at a very early period of this work, in the introduction to Natural-history, Vol. I, page 20. But before we can speak intelligibly upon the subject of taste, it will be necessary to advert to it more particularly; for it will be found, that the pleasures and pains of human life are most intimately connected with this faculty.

In none of the senses is this peculiarity so evident, or so easily recognised, as in that of hearing. Every person who has the organs of the ear complete, is sensible of a difference of sounds; can generally distinguish between acute and grave, and always between loud and low sounds, or quick and slow repetitions of these sounds. This I would call the primary application of the sense of hearing: and there is reason to believe, that all animals who have the organs of hearing are affected in this way as well as man. This kind of sensation serves perfectly well to rouse the attention when danger is near, or to give other notices that tend

to promote the welfare of the sentient being; but this it does without exciting a perceptible sensation either of pleasure or of pain; or, at least, the pleasure or pain that is derived from this source is of such a slight degree as scarcely to deserve notice.

But there is also another sensation which, though not recognised by all men, is perceived in a lesser or greater degree by most men; and this is derived from that combination of sounds which we call music. To some persons it is a source of ineffable pleasure; to others it is pleasing, though it never approaches to that kind of delirium which we call ecstasy; while in a third description of people, no combinations of sounds that can be devised are capable of exciting any sensation of pleasure or of pain, unless when they are in excess, and occasion surprise or alarm for personal safety; for it is infallibly certain, that those who are capable of receiving exquisite pleasure from the power of sounds, are also susceptible of being highly disgusted with some particular combinations of sounds, which excite a degree of pain that is extremely distressing. To those sounds which give pleasure (without here entering into the minutiae of technical distinctions) is given, in general, the name of harmonies; and those which excite an unpleasant sensation have been called discords.

Now, it is evident, to every person who is at all capable of judging in this case, that the degree of pleasure or pain which certain combinations of sounds are capable of conveying to the mind of any one, does not depend in the smallest degree upon the perfection of the organ of hearing; for it often happens that the

hearing is so quick in some persons who are not in the smallest degree affected by the power of musical sounds, that the very slightest noise will be instantly perceived; while another, whose soul is so susceptible of the power of music that all its faculties may be, as it were, absorbed in that single sensation, so as to lose for a time every other perception, shall have the mere corporeal organ of hearing so imperfect that none but very powerful sounds can be rendered audible. These things are so generally known, and so universally recognised, that it is now become a common expression, to say, "Such a one is remarkably quick of hearing; but he has no *ear*"—meaning that he has no ear for music; that is, has no perception of the power of musical sounds.

Nothing can be more plain, from this illustration, than that two kinds of sensation are excited in the minds of many persons through the intervention of one organ; and that the power of that organ may be totally obliterated with respect to one of these sensations, while it is perfect in all its energies with regard to the other: and, as we have seen, that the person who had not the organs of sight could only form an idea of colours by referring it to some sensation that he had felt, and therefore conceived that a scarlet colour was like the sound of a trumpet; so, in like manner, the man who is deaf might possibly conceive, that the sound of a bell was like a white steeple.

But though in instances where the power of the organ is totally obliterated, it is impossible for the person who labours under this defect not to become at last sensible that other persons are capable of per-

ceiving certain things which it is impossible for him ever to recognise, so that he cannot fail to be convinced of that deficiency in himself; yet it is a matter of much greater difficulty to convince a person of a deficiency in his perception of objects cognisable by one of his senses, who upon the fairest trials perceives that he possesses in great perfection the use of that organ through which the sensations he contemplates must be conveyed to the mind; who is sensible, in short, that he recognises with the utmost distinctness the very identical objects themselves that produce those sensations in another which do not affect himself: I say, it is a matter of extreme difficulty to persuade such a one, that this organ in him is obliterated, and that he never can be brought to form a consistent idea on that head: it seems to him to be nothing less than an attempt to persuade him that an object exists, and does not exist, at the same moment; which, his reason tells him, is a palpable absurdity. Yet, notwithstanding the (to him) demonstrative absurdity of such a proposition, nothing can be more certain than that this is actually the case on many occasions: and, as an equivoque of this kind never occurs but in regard to those sensations which have a reference to objects of taste, can we wonder that the opinions of men on this subject should greatly differ? It is as absolute an impossibility that it should be otherwise, as that a triangle should coincide with a square.

Persons, then, who want any one of those secondary perceptions, of any one of the senses, are, in regard to objects of taste, precisely in the situation of the blind man with regard to colours. Let the definition be ever

so correct, it never can convey any precise or discriminative idea to his mind: nor can all the words that the ingenuity of man could combine together ever tend in the smallest degree to effect this. Common sense then says, that this attempt ought never to be made: but unfortunately, as the person in this case cannot perceive his own blindness, he will often, himself, persist in expending all the ingenuity he can command, to prove to you such propositions as that the colour scarlet is precisely like the sound of a trumpet.

I have employed the word *harmonies* above, in the most extended meaning of which the phrase will admit, not as having a reference to musical sounds in particular, but as denoting generally that sensation of pleasure which the mind derives from what I have above called the secondary, or I would now rather say the *harmonic* application of any of the senses; and therefore it has no immediate reference to music considered as a science; so that there is no occasion here to take notice of the distinction which in that science is established between *harmonies* and *melodies*. In like manner, *discords* in the above definition is not to be understood to have any reference to the technical word of the same name in the science of music, but only to denote that unpleasant sensation which the mind perceives to result from particular combinations of objects cognisable by any of the senses. It is not the first time that those words have been thus employed; for it is in this acceptation only that we can understand such phrases as the *harmony of the spheres* — *discordant ideas*, &c. The word *harmonies*, then, in the above definition, we will say for the present,

denotes any sort of pleasurable sensation that the mind derives through the medium of the senses; and *discords* any unpleasant sensation conveyed through the same organs. This kind of harmony is experienced even by the organ of hearing, without any reference to the science of music, in the song of birds, the *Æolian* harp, and many other natural sounds. It is proper that the reader should be forewarned of this, to prevent the confusion of ideas that might result from this circumstance if not distinctly adverted to.

By means of the eye, all animals that are endowed with that organ discriminate external objects. In this application of the organ, man and these animals are perfectly upon the same footing: but man experiences a sensation of a very pleasant kind resulting from objects of sight, which he calls beauty, symmetry, elegance, alike in natural objects as in those of art, which no other animal seems to possess. He feels also an unpleasant sensation derived through the same organs, which he calls ugliness, deformity, or distortion. These sensations I would call the *harmonic* perceptions of this sense; for the pleasurable sensations would rank among the *harmonies*, and the unpleasant among the *discords* belonging to the class of visible objects. Now, although we do not perceive such striking diversities between man and man in regard to the intensity of the harmonic perceptions of visible objects, as in those of hearing; nor does it seem possible to excite an equal degree either of pleasure or disgust by objects of sight merely as by those of sounds; yet still the diversity, in regard to the intensity of this sensation in different individuals, is very great; and where

it is heightened by a combination with the *moral sense*, and some others, it becomes the source of powerfully-ecstatic energies in one person, which never can be recognised in the smallest degree by another, whose understanding and perceptions in other respects may be of the highest order.

Precisely the same observations may be applied to the sense of smell; the primary application of which sense is, to discriminate noxious from wholesome kinds of food chiefly, and to heighten the relish of tastes upon the palate. But, from the harmonic application of this sense, man, as well as exquisite pleasure, derives the most overpowering disgust.

Beside the perceptions that animals obtain through the medium of the organs, there are others that may be called the unorganic senses, that seem to derive their influence from an internal impulse, which, instead of being provoked by the senses, only tend to stimulate these, and to give them a superior poignancy; of this kind, in particular, are, the craving of the appetite for food, which in brute animals is, perhaps, more powerful than in man, except where it is heightened by the harmonic combinations,—and the amatorial instinct, which in some of the human species is a mere animal impulse, and nothing more; while in others, who are strongly susceptible of the harmonic perceptions referable to this head, it becomes one of the most powerful engines in nature for promoting the happiness of mankind, being the parent of an infinite diversity of the finest sympathies that suffuse the soul with those ineffable energies which the phrase *wedded love* conveys to some minds. With a beautiful emanation of

this sort, I beg leave to embellish this dry discussion. There are in this poem, unfortunately, a few Scottish idioms, which will perhaps abate, in some degree, the pleasure it would otherwise afford to an English reader, though to others, who have admired in the Greek language the amiable rusticity of the Doric dialect, it may, by a sort of reflex harmonic combination, convey on that very account, a pleasurable sensation that it could not otherwise have conveyed. The meaning of these phrases will be explained at the bottom of the page.

A SONG FOR SEVENTY.

I told you, Mary, told you true,
 If love to favour had a claim,
 That all its wishes warm'd my breast,
 And you were still the constant theme;
 I told you, then, if mine you were,
 The pride of rank you must forego,
 And all the pomp of drefs resign,
 For wealth I had not to bestow;
 And, Mary, thou didst not reprove,
 But bade me hope, and bade me love.

O, Mary! on thy lovely neck
 The diamond shone with sweeten'd glance,
 And graceful was the silken robe
 That mark'd thy motions in the dance;
 And joyous were the pompous crowd
 Thy birth entitled thee to join;
 Yet pomp, and wealth, and friends, you left,
 To be acknowledg'd, Mary, mine;
 Thou, lovely, didst my suit approve,
 And bade me hope, and bade me love.

'Tis long now, Mary, since we met:
 Stiff are my joints, and hoar my hair;
 Ev'n *your* cheek, too, the wrinkles mark,
 And yet, my love, you're wondrous fair;

And were the wrinkles stronger still,
While accents cheerful grac'd your tongue,
How could I think, but on those smiles
And accents that adorn'd thee young;
When thou, love, didst my suit approve,
And bade me hope, and bade me love?

How often, Mary, has my heart
With secret rapture beat thy praise,
While on your breast our infants hung,
I mark'd their mother's tender gaze;
And still, my love, thy *lad** is proud,
Old as he is, he's proud to see
The *youunkers*† anxious for thy love,
Come fondling round their gran'am's knee:
O! bless the day you did approve,
And bade me hope, and bade me love.

O Mary! much I owe thy care,
Life's best of blessings still you gave;
But now our various duties past,
Our nearest prospect is the grave:
Yet, conscious of a virtuous life,
We shrink not from the solemn scene;
Sigh, sigh, we must that we shall part,
But soon, my love, we'll meet again,
Where endless pleasures we shall prove,
Nor ever, ever cease to love. I. B.

It is to be hoped that HAFIZ will take in good part these imperfect hints intended to afford him some satisfaction: The subject is here, however, but very superficially touched upon; should I have reason to believe that it would prove agreeable to my readers in general, it might, perhaps, be rendered more perspicuous by some additional observations in some future Number of this work.

* *Lad*, a young man, the common name for a *lover* among the lower classes of people in Scotland; here beautifully applied by a delicate glance to denote that his perceptions are still the same.

† *Youunkers*, a familiar phrase for young persons.

QUERIES RESPECTING THE MEANS OF OBTAIN-
ING WATER FOR THE PURPOSES OF A FARM.

For Dr. Anderson.

SIR,

HAVING returned a few years ago from India, where I had acquired a small competency, with which I was contented, I hastened to make a purchase in the country, which, from a circumstance that escaped my attention at the time, I am afraid will prove an unlucky one, unless you can afford me some assistance.

Having been bred up in the country when a child, in the bosom of a family where innocence, peace, and comfort ever dwelt, I sighed for the return of enjoyments similar to those which I had formerly tasted there. This rendered me somewhat eager to make my present purchase; but my patrimonial residence having been in a part of the country that abounded with springs of living water, I had never experienced the inconvenience that results from the want of it, and was not on my guard respecting that circumstance. At the time when I first viewed this place, every thing appeared to be cheerful and luxuriant. Nothing indicated the want of water, and I never thought of making inquiries respecting it; but last summer, which was the first of my residence here, feelingly taught me how precipitant I had been. The first circumstance that gave me a hint of this particular was, a kind of sickly nauseous taste that I perceived in the water with which I used to wash my mouth in the morning. Thinking that the chambermaid had neglected to

change the water, I ordered it to be taken away, and fresh water put in its place. The water was changed, but the taste remained. This induced me to inquire into the cause; and then I learnt that there was not a single fresh water spring on the whole premises, nor for many miles around, not even so much as a pump-well. I then also learnt for the first time, that one of my predecessors had sunk a shaft for upwards of one hundred feet in quest of water, but in vain; and that, in fact, the want of water was one of the principal reasons why this property, so desirable in other respects, had so frequently changed owners. I found that the house was supplied with water from a tank, or pond, or reservoir, made for that purpose at a small distance, and from whence it is conveyed under ground through pipes. This open tank, exposed to the sun, and crowded with aquatic plants, becomes a nauseous object during the summer months; and since I have seen it, I can scarcely eat without disgust any victuals, in the preparation of which I think water must have been used. But this is not the greatest evil.

Similar tanks, or reservoirs, have been formed in different parts of the ground for affording water to cattle, all of which are liable to still greater defects. The water there not only becomes offensive in consequence of the sun acting upon it in its stagnant state, but is rendered still more nauseous by the cattle wading in it when the warm weather approaches, and filling it with impurities of every sort, which excite the most displeasing ideas the moment they come into view. But even this is not the worst: these tanks were wholly dried up last summer, so that not a drop of water of

any sort could be obtained from them. It then became necessary every day to drive the cattle off the premises more than a mile and a half to water, a circumstance most painful and distressing. The people said, they had never seen the like before; but it became so intolerable to me, that I would willingly have sold the property, but no purchaser could be found. I then made every possible inquiry, to discover a remedy for this inconvenience; and was told by a friend, that some hints for the discovery of springs occurred in your Treatise on Draining, which I immediately purchased, and read over with avidity; but none of the cases that you describe seem to apply directly to my situation. I read your Recreations also with much satisfaction in other respects, but have in vain looked for some elucidations on that head. I have at length resolved, after a considerable degree of hesitation, to presume so much upon your candour, as to trouble you with this letter, to request that you will favour the public with some hints that may serve to alleviate, if not to remove this serious evil, which I understand is experienced to a very great extent in many parts of the island. I will prolong this letter so far only as to say, that the subsoil in all this district is a firm clay, that extends to a greater depth than it ever has been penetrated; that the surface is a little soft in winter, and is abundantly productive of grass, though a few rushes make their appearance upon it, and though there is a sufficient descent from all the fields; nor are we commanded by any higher ground near. Should you indulge me in this respect, it will confer a particular favour on

ASIATICUS.

IN ANSWER TO THE ABOVE.

I WISH it were in my power to give a satisfactory answer to the queries of this respectable correspondent; but though it be, perhaps, impossible to suggest a remedy that would prove entirely efficacious *in all cases*, yet the evil certainly admits of alleviation; and I shall take pleasure in suggesting a few hints that may have such a tendency.

From the circumstances above stated it is evident that the soil is perfectly retentive, so as not to allow any water to percolate through it. This gives to the owner one advantage over those who are situated upon an eminence, where the subsoil to a great depth consists of sand or other porous substances; because a reservoir that will be capable of retaining water can be here made at a much smaller expence than in the other case; for, in a pervious stratum, the bottom and edges must be all puddled with care, which, when of any considerable depth, is rather a nice process; and, if it be done carelessly in any part, it does not easily admit of repair. In the present case, it does not appear to me that the difficulty will be great in providing the house, at least, with abundance of good and wholesome water at all times, and at a very moderate expence.

For this purpose, I would beg leave to direct the attention to one never-failing source of water in this island, which, if duly husbanded, will certainly preclude the danger of want at any season for almost any purpose, either for man or beast, that can ever occur. I here refer to the rain that falls upon the roofs of houses, which amounts to a much greater quantity than most persons are aware of. It has been ascer-

136 *Hints for collecting Water for Farm uses.*

tained by repeated experiments, that in scarcely any part of this island does there fall less than twenty-eight inches depth of rain in a year. At this rate, there will fall upon every square foot of roof of any house above seventeen gallons and a half of water; or upwards of two hogsheads and a half on every square yard. At that rate, a house of thirty feet in length and twenty-one in width (which is not larger than an ordinary cottage), would collect one hundred and seventy-five hogsheads in a year, which would afford the expenditure of half a hogshead a day. There are few farms with their offices that have not roofs to ten times the extent of the above; so that, were this water all preserved, they could expend at the rate of five hogsheads a day throughout the whole year, which would be sufficient for a very extensive stock of cattle. But when we consider, that in every situation cattle can be easily supplied with water from other sources for the greatest part of the year, it will appear very plain, that if all this water were carefully preserved, no farm could ever be in want of water for cattle or other purposes. All that is wanted then is, to discover an easy manner of collecting and preserving that water till it shall be wanted; which I shall proceed to show is not a difficult matter.

Few houses are now built without having spouts placed along the eaves to collect the rain water and convey it into a reservoir, usually a wooden cask, for the purpose of washing. But this reservoir is usually so small as soon to be filled, when the surplus runs over and is lost. Instead of that, let the whole of the water thus collected be led by pipes to one place, where it may be let into a well dug in the ground to a proper

depth for that purpose, and covered at top. It will there be screened from the sun, and prevented from evaporation, so as to be kept sweet and cool as long as necessary; and we all know that no water is so pure and wholesome as rain water.

To those who are peculiarly delicate, however; it may occur, that some impurities may be washed off by the rain from the roof, which they would wish to get rid of. This may be easily and effectually done, by sinking another well at a moderate distance from the first, making a passage between the two near the bottom, to be filled up with small clean sand and gravel, through which the water must percolate before it reach the last well; in consequence of which it will be perfectly purified. The pump for supplying the family should be fixed in this last well, where it will of course find nothing but pure water.

For the sake of cattle, if it be necessary, let another reservoir be formed, also under ground, near to the pump well, with which it may communicate by means of an opening at one side near the top of the well, through which the superfluous water will run off whenever it rises above that level. This may be made in the form of a trough covered as far as may be found convenient, and open towards one end for the cattle to drink, without allowing them to set their feet in it.

If the house be upon an eminence, it will be very easy to convey the water from this last reservoir, by means of a pipe under ground, to any convenient part of the fields, or the garden, where it may terminate in a box to communicate with a trough for the cattle by means of a ball-cock, which always allows water to flow into the trough as it is drawn off, and closes

of itself when it is full, so as to keep it always full without ever running over. In this way abundance may at all times be had without any waste; and the pure element procured for the cattle, without any extravagance of expenditure. If pools are made in the lower places of the fields, the cattle may in these occasionally cool themselves; but if they have ready access to the troughs, they never will drink there.

I scarcely need observe, that for fields which are at a distance from the house, where the surface of the ground is not a dead level, wells of this sort may be formed by collecting the water that flows over the surface of the ground during rainy weather, and leading it into these wells. But these reservoirs should be always covered, and only have an open trough at one place to allow cattle to drink.

By this very simple contrivance, many parts of the country that are now much distressed at times for want of water, may be effectually relieved, so as never to suffer any future inconvenience; and much expence in carting water to many villages might be entirely saved.

Mode of obtaining Food for the Nightingale in Russia.

DRIED ants eggs are to these birds a great regale, and the mode of obtaining them is as follows. The Russian shepherd shapes out a space about three yards square, on some sequestered piece of bare beaten ground, commonly a bye road, and surrounds it with a wet ditch, two or three inches broad, and an inch or two deep. Into the centre of this little fort he thus brings a whole hillock, with all its contents, and scatters it about, leaving here and there (on spots kept clean for the purpose) little heaps of

small fir branches, under which the whole diminutive community hasten to conceal their eggs, with all the industry so well remarked by Solomon, as the only hiding places which the wet ditch permits them to reach with those precious deposits.

By this simple stratagem the lazy shepherd, when he has lolled his hour out on the adjoining turf, finds the whole of the insect treasure under the fir branches, carefully separated from all extraneous substances, and fit for market, either fresh or dried, according to the season, where he sells by measure to the numerous amateurs of the nightingale.

Index Indicatorius.

- . IN answer to the queries of *Hortensius*, of *Eboracus*, of *Britannicus*, of *Ruricola*, *Pomona*, and several other correspondents, I have the pleasure now to be authorised to inform them that Mr. Forsyth's book is in such forwardness as to be all completely written out, and only wants revisal, and such additions as a careful perusal may suggest; and I am happy to be able to congratulate the public on the *certainty* that scarcely any accident can now prevent it from being published. The plates are now, I have good reason to believe, in the hands of the engraver.

It may to some appear rather a little extraordinary that I should express such anxiety about the forwarding of that performance; but those who have been in the habit of reading books on rural affairs, and who, of course, know how little is indeed new in these; one who has been sickened by the repetition of the same things over and over again, under various forms, and different language, it is true, but still the same for hundreds of times, will feel what a high gratifi-

cation it is to get something that is actually the result of experience and observation. Such is my situation in respect to the work in hand. I had long observed the accuracy of the remarks, and the utility of the practice that had been adopted by this judicious horticulturist, and I feared that death might deprive the world of the benefit that might be derived from the knowledge of them; and was anxious on that account. I am now at ease in that respect, and feel a high gratification from that cause. We have many writers, but few observers; innumerable retailers of stale goods, but few that can furnish a substantial dish raised fresh by their own industrious exertions.

A letter from a peevish correspondent was received some weeks ago, and is accidentally mislaid, which prevents me from mentioning the name. It is the second in that strain that has been received since the commencement of this work. The only notice it seems to require is merely to say, that before one attempts to convince another, he ought himself to be fully convinced. It is impossible that the writer can seriously believe what he asserts, otherwise he must view things through such a medium as ought to excite the compassion of every humane mind; for in that case he must labour under the most pitiable disease that can affect mankind.

A bundle of papers has been accidentally mislaid, in which were several letters from correspondents, the contents of which cannot be so distinctly recollected as to admit of a proper return. It is hoped this intimation will be admitted as an apology for the delay in noticing them particularly.

21.

NOVEMBER 1800.

RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,

ARTS, & MISCELLANEOUS LITERATURE.

N^o 3. VOL. IV.

AGRICULTURE.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, particularly with a view to a proposal for instituting a national experimental farm.

[Continued from Vol. III. page 99.]

ON THE VARIETIES OF THE BOS TRIBE.

Part 4th. *As respecting bodily strength, and ability to bear fatigue.*

I NOW return from the parenthesis concerning the dairy, so naturally connected with the subject of my former disquisition.

VOL. IV.

M

That the ox was long considered as the principal beast of burden employed by man in a domesticated state in temperate climates, can admit of no doubt. In sacred writ, and the works of eastern authors in general, the ox is ever mentioned as the only animal universally employed in the plough. The same thing is observable in the agricultural writings of Greece and Rome. In India at this hour, bullocks are almost the only beasts of burden that are there employed for the purpose of transporting weighty commodities; and it is not beyond the memory of the writer of this article, that cattle were universally employed for the plough in the northern districts of Scotland, where they are still frequently used for that purpose. Horses, indeed, have now acquired a decided superiority over them in this respect, and have entirely banished them from the road every where; and from the plough also, except in a few of the remotest districts of the kingdom: yet, as many persons still consider this as an innovation which is uneconomical both in a private and national point of view, it will, by them, be considered as a circumstance of some importance, to have the energetic powers of the respective breeds distinctly ascertained. If ever this be done, it doubtless belongs to a public national institution of the kind here proposed to do it.

As there have been, however, only a few individuals in this island who have had a predilection for the bullock as a beast of burden, this peculiarity respecting these animals has obtained only a small degree of attention among us for many years past; and the comparative trials between different breeds of cattle as to this particular have been so few, that we are

enabled to draw no decisive conclusions from them.

Indeed, in as far as I have been able to observe, little attention has been bestowed to any circumstance respecting the ox as a beast of burden, unless it be his mere bulk or weight alone; though there can be no doubt, that the energies of cattle, as well as of many other animals, are by no means necessarily connected with their size. A prejudice seems, in general, to prevail in favour of small breeds of cattle in this respect; for these are very commonly believed to be more nimble and active, and more capable of enduring severe and continued exertion, than those of a larger size: but I know of no instance in which this has been subjected to the test of fair and accurate experiment; nor am I inclined to think, that the general prejudice would be in this respect invariably confirmed, although it might be so in some cases. Probably it would be found, upon an accurate investigation, that some breeds of large cattle are hardy and active, while others are heavy and dull; and that some breeds of small cattle are puny and lifeless, while others are extremely active and vigorous for their size: but this, as well as the former, is at present merely matter of opinion that rests upon probabilities only; and ought, if it ever shall be deemed worthy of notice, to be subjected to the test of experiment.

In favour of this opinion it should be observed, that the bullocks most esteemed in India for transporting goods are not of the largest sort. The Arnee, as I have been given to understand, is never employed for that purpose; neither are those of the smallest sort employed there, which are deemed too feeble a race. In

164. *Varieties of Cattle.—Respecting the Hide.*

Boötan, the Yak is occasionally employed to carry burdens; but this seems to be rather through necessity than choice, as they appear to have no other breed of bullocks in that part of India. Mr. Turnbull, already quoted (Vol. III, page 10), seems to think that the American buffalo possesses a power of exerting a much greater degree of bodily strength when compared with one of the common breed, than what corresponds with the difference of its size; and I was assured by a man who employed a Zebu for drawing a waggon, that its strength much exceeded that of one of our oxen of the same size: but I am aware of the little reliance that can be placed on assertions of this kind when made in a singular case, as here occurred. It appears, however, to be very generally admitted, that the Holderneß breed of cattle, though of pretty considerable bulk, are not thrifty when employed in draught; that the Lancashire long-horned breed are better than these for that purpose; but that the Devonshire breed considerably excel any others known in the southern parts of this kingdom as beasts of draught. But until it shall be ascertained, that the ox is, upon the whole, a more profitable beast of burden than any other that can be employed in this island, it seems to be unnecessary to extend our observations to a greater length on this head.

Part 5th. *Of the varieties of cattle respecting their skins.*

I mention this, and several other particulars in the present disquisition, chiefly with a view to call the attention of the public to these objects, so as to discover

Varieties of Cattle.—Respecting the Hide. 165

whether any striking diversities shall ever be observed in regard to these particulars. The quality of leather is an object of too much national importance not to demand a very particular attention to every circumstance that may affect it; and this is one that never has yet been adverted to. Indeed, by the opinion which has hitherto prevailed, that all the varieties of the same class of animals were radically the same, the attention has been lulled asleep in regard to this particular; and facts that casually occur pointing at particular diversities have been totally disregarded. With respect to leather in particular,—so much of its good or bad qualities must in every case depend upon the mode of dressing it, that we have too rashly, perhaps, been inclined to attribute the *whole* of the differences we meet with between the quality of the leather prepared from the skins of different animals of the same class to that cause: yet, that there are diversities in that respect in the undressed skins themselves, I see no reason to doubt. The buffalo skin seems to be more easily susceptible of that rough open kind of dressing which we call *buff* leather than any other; and the hide of the Bison of Louisiana can, if my information be correct, be more easily softened and dressed into a lighter leather than any other skin of the ox kind that has yet been discovered. The strongest proof, however, I know of a diversity being perceptibly recognised between the skins of different breeds of the same animal, was discovered in Shetland, where they have one breed of sheep that is particularly distinguishable from others by the fineness and softness of its *wool*; and the *skins* of that breed of sheep are re-

cognised by the inhabitants as readily after the wool has been separated from them as before, and sell at nearly double the price of other skins of the same size; because it is found, that for the purpose of making leathern aprons for a particular class of mechanics, they are both pleasanter in the wear, and last much longer than the others. This is a fact so well known in that district, as to have been remarked by every inhabitant of it; and these sheep, not less on account of the softness of their skin than that of their fleece, have by common consent obtained the name of the *kindly* breed of sheep.

A circumstance of a similar sort has been also remarked with respect to the skin of a certain class of live animals in this country, though I know not whether any attempt has ever been made to trace the qualities of these skins after the creature is dead. It is well known, that one of the principal points upon which Mr. Bakewell and his disciples rely as decisive in their choice of cattle for feeding, is a *kindly* skin; that is, a skin that feels soft, though firm to the touch, which is equally distant from the hard dry skin peculiar to some cattle, as from the loose and flabby feel of others. These are indications that point out variations which ought to be traced farther than has ever yet been done.

Part 6th. Of the varieties of cattle, respecting their tendency to fatten easily—the flavour of their flesh—and other peculiarities.

That different individuals of the same class of animals have a tendency to fatten more kindly, and at an

earlier age than others, cannot be denied; and as little can it be doubted, that this quality is transmissible to the descendants of those individuals which possess it in an eminent degree. We have already had occasion to take notice (Vol. I, page 75) that Mr. Bakewell and his disciples, while they support these two positions, and indeed prove it by the most undeniable facts, endeavour to persuade those who listen to them, that these qualities originate in the form of the individuals, and are not the inherent qualities of the original breed. Those positions, having been already controverted, require no farther notice in this place, than barely to say, that the attention having been directed towards a wrong object has prevented those investigations on this head from taking place which otherwise would have been unavoidable. This, then, is a subject that requires farther elucidation by experiment.

In no country on the globe is the *carcase* of animals of so much value, when compared with the total price, as in Great Britain; and therefore perhaps more attention has been bestowed upon this department in this country than any where else; yet even here our progress has been but small. The objects that have been chiefly adverted to were, to try how the greatest quantity of flesh and of fat, in proportion to the offal, could be most effectually obtained, and in the shortest time; but as to the *quality* of the meat, that has been entirely put out of the question. So little, indeed, has the *quality* of meat been attended to, that I do not know of a single fact upon record, which even tends to ascertain, with any probable degree of certainty, either that the flesh of one breed of animals of

168 *Varieties of Cattle.—Respecting Flavour of Meat.*
the same species is of a finer quality than that of some others, or what the circumstances are that render the meat of different individuals of the same breed of creatures more or less palatable, though every person is ready to admit that the difference between two pieces of meat of the same kind is very great; and the general opinion is in some cases so strong as to pronounce with a decisive tone of certainty in regard to this particular. It is, for example, I believe admitted without hesitation, as a certain fact, by every person in London, that Welsh mutton is beyond comparison more delicate than English mutton; but when we look for proofs to authenticate this fact, I know not where they are to be found. I myself have adverted to this circumstance, and am inclined to believe that it is true; for, assuredly, the difference between the flavour of mutton that I have eaten in Wales and in England is such as to admit of no degree of comparison in my opinion: but whether this superior flavour is to be ascribed to the food they pick up on the airy mountains, to the age at which the sheep are killed, or to the nature of the breed, has never yet been attempted to be ascertained by any decisive experiment; though few persons who speak upon the subject hesitate to decide upon it with as much certainty as if it had been fully proved; one person maintaining, that it is owing entirely to the mountain air and clean pasture; another, to the size of the sheep; a third, to the age; but few seem as yet to have taken it into their head to suspect that it may be ascribed in any degree to the peculiar nature of the *breed*, which I myself am rather inclined to suppose: and this I do

Varieties of Cattle.—Respecting Flavour of Meat. 961

from the clear proofs which we have, that the quality of the wool, the colour, the size, the shape, and every other perceptible peculiarity, is influenced by the breed in a most obvious manner; and, why may not the taste of the mutton be influenced by the same cause? It is also admitted, that the South Down mutton is of an excellent quality, although these sheep are managed in all respects as most of the sheep in England are. The difference in this case, then, must be clearly attributed to the breed.

This idea seems to be in some measure corroborated by a prejudice which appears to prevail as universally in favour of *Highland* beef as of Welsh mutton; for it seems to be generally admitted, that no beef known in this country is equal in quality to that afforded by a *Highland* *stot*; or, as it is more commonly called in England, a *Kiloe bullock*, when fully fatted. In this case, however, the influence of the mountain air is put out of the question; for all the Highland beef that is killed in London has been fed in England; and as the quality of beef is not supposed to depend so much on *age*, as that of mutton, we are here brought some steps nearer to the conclusion, that if there be really a difference in the quality of Highland beef from that of other cattle, it must depend more upon the *breed* than other circumstances: and that there is a real difference in the *quality* I believe no person will attempt to deny who shall take the trouble to compare a buttock of genuine Highland beef with one of the large Holderness breed, both of which have been equally well fatted. Without pretending to decide in this case, which of the two is best—all I contend for is, that

170 Varieties of Cattle.—Respecting Fat and Flavour.

they will be found to be different in *quality*; and if they are different, that this difference must be owing to the influence of blood. This being admitted, the plain inference is, that other breeds may, with regard to this particular, differ from them both in many respects: and if so, we must be groping in the dark until all the peculiarities affecting each breed shall be fairly ascertained by judicious and accurate experiments.

That some breeds of cattle have a tendency to generate fat on certain parts of the body in great quantities, pure and unmixed with flesh of any kind, while others have it more intimately mixed with the flesh in every part of the body, will not be denied. That the lean of some kinds of beef is hard, dry, and stringy, though covered with fat, like the lean of hog's flesh, while that of others is naturally more tender and juicy, will scarcely be disputed; and that the meat of some kinds is more delicate and savoury even in this country, few will be inclined positively to gainsay. That beef in some other countries, particularly that of the buffalo and musk ox under certain circumstances, is more harsh and disgusting than ours, appears to be certain; and that it is better than with us in other countries, seems to be equally undeniable, from that unanimity with which gentlemen who have lived long in India concur in admitting that they have never seen beef in England that they thought was equally good with what they had eaten in India, particularly on that part which forms the hump on the shoulder of the Bison. There seems, therefore, no reason to doubt that the varieties of the same species of animals exhibit a diversity in re-

gard to the taste, flavour, and consistence of the flesh which they afford, as well as in respect to other circumstances. This particular, therefore, demands the attention of improvers as well as others.

[*To be continued.*]

On the practicability of producing fine clothing wool in Britain: selected chiefly from Dr. Parry's excellent pamphlet on that subject, just published.

Magna est veritas, et prevalebit.

It must, doubtless, afford a very high degree of satisfaction to every well-intentioned inquirer, who has set himself to combat long-established prejudices, to find, that what he scarcely ever expected to see accomplished, is completely effected in his own time. Precisely such a satisfaction it has been my fortune to experience in the perusal of the very important publication from which I am about to make a few extracts.

It is now more than thirty years since I first ventured, in consequence of a deep and attentive investigation of the subject, to state to the public the reasons which satisfied me of the practicability of rearing fine clothing wool in this island, and to recommend it as an enterprise that well deserved to be attempted. For many years these investigations were wholly unattended to; and the book ("Observations on the Means of exciting a Spirit of National Industry") in which this, with several other discussions that appeared to me important (in particular, a full refutation of Dr. Adam Smith's hypothesis respecting the corn laws, the hurtful tendency of which, should these principles

ever be adopted by our legislators, I then foresaw, and endeavoured to obviate), attracted so little attention as to be known only to a few persons. We, at the present moment; labour under the severe effects of that evil which I then endeavoured in vain to ward off. The subject of wool, however, after the lapse of many years, began to attract some notice; rather, I believe, on account of my having endeavoured, in another publication, to correct the erroneous hypothesis of Buffon with respect to the breeds of animals, than from the real importance of the subject which occasioned that correction. The adherents of that philosopher wished to support his hypothesis; but, finding that this could not be done without establishing certain facts, in their attempts to establish these, the discussion I wished to awaken necessarily took place; and a perfect conviction, on their part, of the erroneousness of that hypothesis was the result. This conviction among literary men served to detach *them* from the party of the credulously ignorant, with whom they had formerly coalesced; and something more than mere rhapsodies was expected as an answer to serious arguments grounded on well-authenticated facts. Those rhapsodies which, from time to time, appeared in pamphlets as if to lull the people asleep, were not suffered to pass, as before, for undoubted truths; some opponents to these, from time to time, appeared upon the arena; new facts, corroborative of those which I had formerly collected, were, in consequence of a continued attention to the subject, daily discovered, which I sedulously brought forward in various publications. In the midst of this slow though unceasing progress in

the attainment of truth, it occurred to me to put into the hands of sir John Sinclair, Bart. a memoir on this subject, in which I had concentrated, as well as I was able, all the facts that had occurred to me at that time, and arguments to show the benefits which this country might derive from the rearing of sheep bearing fine wool. The magnitude of the object struck him; and the activity of pursuit, which so eminently characterises that gentleman, enabled him to connect together a number of public-spirited men for the purpose of forwarding these views, and to unite them into one body under the name of the Society for promoting the Growth of British Wool; and though this institution, like most of those established for similar purposes, did not perhaps produce all the good that its most sanguine promoters hoped or desired, still it was productive of much service, by exciting a spirit of inquiry on this subject, which will in time correct those little errors into which speculative inquirers must inevitably sometimes fall. And although the public seem not, at the present moment, inclined to give sir John all the credit they may have once done, for his efforts in that line, yet I think it my duty thus, unequivocally, to declare the high sense that I, individually, entertain of the energy of his efforts, and the benefits that have resulted from them; nor do I believe that there is one man in the island who could or would have done so much as he did respecting it. As to my own share in it, I have also to say, that the memoir which sir John took up, had been previously shown to several others, who treated it with silent neglect, instead of favouring it with that serious attention and warm

notice which it obtained from him. Thus much for retribution.

The subject of fine-woolled sheep having thus at length been brought more forward to public notice than before, by several bolder statements than formerly, these statements were warmly controverted; which only served to render conviction of their truth the more and more general. I have not, myself, taken any part directly in these controversies, but have proceeded as occasion admitted to state such additional facts as occurred to me, tending to show what were the measures most likely to promote the improvement of the race of wool-bearing animals as well as others, which must be in the recollection of all my readers.

Dr. Parry, of Bath, has at length entered the lists against those who strive to defend the antiquated tenets which had been blindly respected for ages, but which are now so completely and satisfactorily refuted by him as to admit of no serious reply. In the course of that discussion he has fully established, by experiments and conclusive arguments urged in the very handsomest manner, almost every position that I had ventured to hint at; and I trust I shall be guilty of no offence by availing myself of the following passages, as a valuable appendix to what I have heretofore offered in this work on the subject of wool-bearing animals.

In corroboration of what had been urged respecting the wool of British sheep suffering no material change in Jamaica, he adds (page 21):

“ On this subject I have this day (September 24th, 1800) had very satisfactory information from an intelligent gentleman of Jamaica, who was accidentally

speaking of the sheep in that island. I asked him
“ if they did not bear hair instead of wool.” He
laughed, and said, “ that the sheep of which I spoke
“ were a breed originally brought, as he believed, from
“ the Spanish main, and in appearance more resembled
“ goats than sheep ; but that he had himself possessed,
“ for fifteen or twenty years, a flock of nearly a hundred
“ sheep, of which the ewes were originally from England,
“ and had been crossed by rams from the Dutch island
“ of Curasoea : that they were a short-legged, full-bodied
“ breed, very similar to the South-down, the wethers
“ weighing from fifteen to eighteen pounds a quarter :
“ that they were never on the mountains, but always
“ kept near Kingston, and were far from having hair,
“ but had very good coats of wool, exactly similar to
“ English wool.” So much for the effect of climate
in permanently altering the quality of the wool.

He then proves by undeniable facts, that the wool
of Spanish sheep kept for a length of time in England,
and those reared there, has not degenerated ; and that,
by a cross between Ryeland ewes and a Spanish ram,
he has produced as fine wool as any that is brought
from Spain, though under circumstances which tend
to show, that the peculiarities which have been deemed
inimical to the production of fine wool in this island
do not indeed produce any sensible effect on this ar-
ticle. He thus concludes this part of his discussion :

“ I have thus, I trust, sufficiently proved, from ac-
tual facts, the practicability of producing in England,
from a cross of Ryeland ewes with Spanish rams, and
without the intervention of a single Spanish ewe, wool
equal to the finest which is imported from Spain ; and

this, under the indiscriminate use of the coarsest food, in small inclosures, without housing, or any other management than what is common to the hardiest and most ordinary of our sheep."

As to the carcasses of these sheep, he says (page 41) "the wethers, when tolerably fat, will weigh from twelve to fifteen pounds a quarter; the ewes from ten to twelve pounds. Having constantly had this mutton for my own table, I know, by experience, that its flavour is excellent; and in this respect none of the sheep have exceeded, and scarcely any equalled, a wether that was killed this summer, and which came nearer to the Spanish blood than any that had preceded it. On account of its size and taste this mutton has always been much coveted; and has sold in the market for the highest price. As to the disposition of these sheep to fatten, I have been otherwise too much occupied to have made any accurate trial; but the eight-toothed rams, which I have already mentioned as having last year gained the premium for fine wool, and as having weighed on the 17th of June, without their fleeces, four hundred and forty-six pounds, weighed alive, on the 14th of September following, five hundred and fifty-six pounds; so that in three months they had gained, on an average, fifteen pounds and a quarter each, or eight twenty-sevenths (almost one third) on their original weight. I believe that few sheep of any breed, running with many others in feed of moderate grass, would have acquired in the same time a greater relative weight."

I must now pass on to the following comparative statement of the value of the wool of this Spanish

breed of sheep with that of other favourite varieties (page 44).

“ From an account procured at my request by lord Somerville from Arthur Young, Esq. I find the following to be the average weight of the fleece relatively to the living weight of an ewe in tolerable flesh, of the respective breeds :

	lbs.		lbs.
Lincoln fleece	8½	Living ewe	140
New Leicester	7		130
South-down	3		125

To which I add from my own observation,

Ryeland fleece	1½		60
--------------------------	----	--	----

Whence it appears, that the wool is to the living weight,

In the Lincoln as	1	to	16½
. New Leicester	1	to	18½
. South-down	1	to	41½
. Ryeland	1	to	34½

On the average of my two shear ewes, the weight of the washed fleece will be four pounds, and the living weight sixty pounds ; or, as one to fifteen.

“ Let us now compare the value of the fleeces.

	s.	d.		s.	d.
The Lincolnshire, at	0	8½	per lb. is	6	0½
. . . New Leicester	0	8½		5	1½
. . . South-down	1	10		5	6
. . . Ryeland	2	4		4	1
My wool unwashed, 4½ lbs.	2	10		12	9

In order to show this difference of value still more clearly, I will state the value of the wool of each different breed proportionably to one given living weight of carcase. If we bring them all to one hundred and forty pounds, the supposed weight of the Lincoln, then

the account will stand thus :

Annual produce of wool on 140 pounds of living weight.

	£.	s.	d.
In the Lincoln breed	0	6	0 $\frac{1}{4}$
New Leicester, about	0	5	6.
South-down	0	6	1 $\frac{1}{4}$
Ryeland	0	9	6 $\frac{1}{4}$
My mixed breed	1	9	9

“ Hence it appears, that my breed carries more than three times the value of wool on the same living weight of carcase that the Ryeland does ; almost five times as much as the South-down and Lincoln ; and nearly five and a half times as much as the new Leicester.”

“ The difference (he proceeds, page 47) in the annual value of the wool being such as I have above stated, it appears, that in order to bring the annual profits on the other breeds to a level with that of mine, the gain on an equal weight of their carcasses, from the same quantity of food, should exceed that on my sheep in the following proportions :

	£.	s.	d.
The Lincoln ought to be superior by	1	3	8 $\frac{1}{4}$
... New Leicester	1	4	3
... South-down	1	3	7 $\frac{1}{4}$
... Ryeland	1	0	2 $\frac{1}{4}$

In other words ; in order that the profit on a Lincoln sheep, wool and carcase included, may equal that of mine, it is necessary, in order to compensate the inferiority in point of wool, that one hundred and forty pounds of his carcase should gain in one year, from the same quantity of similar food, as much more flesh and fat than mine as shall amount, at sixpence per pound, to nearly forty-seven pounds and a half. It must here, however, be considered, that these two sorts

of mutton ought not, in fairness, to be estimated at the same price; this mixed breed, on account of its size for small families, and its superiority of flavour, always obtaining a penny per pound in any well-frequented markets more than the larger kinds. If this principle be admitted, the superiority of weight required in the Lincoln sheep will be more than fifty-five pounds; and so on *mutatis mutandis* of the other breeds.

“ I offer these calculations as *data*, from which the farmer, previously to the institution of suitable experiments, may judge of the general probability of profit or loss from this new breed of fine-woolled sheep, comparatively with those with which he is already well acquainted.”

Candour obliges me to add, that from the whole of Dr. Parry's experience it seems to be very plain, that these sheep thrive well, and discover a disposition to fatten as well as any other unselected breeds in Britain.

It is very remarkable, that the *quantity* of the fleece is augmented in a yet higher degree than the quality of the wool, which tends very much to add to the profit to be derived from this breed. The following statement will show this in a very conspicuous point of view :

“ I have inquired (he says, page 51) of two experienced farmers, what return they would expect to receive annually from an acre of down land, worth seven shillings, depastured with any English breed of short-woolled wethers : and they have agreed, that the return could not exceed fourteen shillings ; supposing the acre

on an average to keep two sheep. If, then, I content myself with allowing only the same number per acre, and state the produce of each wether to be five pounds of wool, at two shillings and ten-pence per pound, the return will be one pound eight shillings and four-pence, which is more than treble the profit on the English sheep on the same land. Let it also be observed, and never for a moment forgotten, that this profit arises from the fleece only, without the smallest allowance for the improvement of the carcase.

“ This is a most important fact to the farmer, as it points out a profit independent of the contingency and cares of fatting; and at once raises the value of mountains and wastes to a level with that of good inclosures.”

From Dr. Parry's experiments it appears to be incontestably established, That permanent changes in the peculiar qualities of any breed of sheep can only be effected by an intermixture of blood:—That the kind of food, climate, or management, have no tendency to alter the nature of that breed, though they may produce some *temporary* variation in respect of the quality of the wool and carcase of the animal:—That, by a proper selection of individuals, any peculiar quality wanted may be much improved without any crossing of the breed:—That, by means of judicious crossing, great and permanent changes may be effected; but that some crosses accord together much better than others; the cross between the Spanish and Ryeland, for example, better than that between the Spanish and Morfe breeds:—That the *quality* of the wool of the first of these cross breeds has become, after three

or four crosses, fully as fine at least as the best Spanish breed, and much finer than the Ryeland, though he does not think the improvement is considerable by one or two crossings, nor complete till they have at least five sixths of Spanish blood:—That the *quantity* of wool afforded by this mixed breed, in proportion to the weight of carcase, is prodigiously augmented beyond that of the original stock; and that the race is hardy, and healthy, and by no means delicate in regard to management:—That as fine wool can be reared in England upon this mixed breed, as any that comes from Spain, and which is capable of being worked into cloth and kerseymere of an equally good fabric as those made of Spanish wool:—That the mixed breed producing this fine wool would thrive upon our bare downs, equally well as the sheep usually depastured upon them; and that, of course, the quantity of wool reared in this island might be prodigiously augmented, and its annual value in a yet higher proportion; but that, lastly, it is not possible to obtain in this country as yet, a price for that wool nearly proportioned to its real value. He therefore strenuously contends for the propriety of admitting a free exportation of wool in order, to promote a fair competition in other markets, so as to allow it to find its own intrinsic value: and he adduces such arguments on this head as will not be easily refuted.

I have already stated, that the ewes which Dr. Parry so successfully crossed with the Spanish rams were of the Ryeland breed; but he observes, page 92, that Mr. Whittaker, of Bath, “has for several years tried the cross of the Wiltshire breed. The wool has become

almost treble in quantity, and extremely meliorated in quality. The carcasses are rendered smaller; but the mould is considerably improved, and the disposition to fatten so much increased, that a butcher this season examining his flock, immediately fixed on those that came nearest to the Spaniard, as far as the third and fourth generation, preferably to any that approached more to the original stock."

Dr. Parry specifies also the remarkable uniformity in the quality of the wool on every part of the body on this improved breed, which affords much less coarse wool than is usually obtained from the carcasses of other breeds; and takes notice of the facility with which that valuable peculiarity may be still farther improved by a proper selection of individuals to breed from. I shall conclude my extracts from this judicious performance with the following, which, it is not doubted, will prove satisfactory to every candid inquirer; it occurs at page 31.

"In order that the public may judge for themselves as to the qualities of my wool, I have deposited with Mr. Bartley, secretary to the Bath Agricultural Society, five specimens of tolerably fine wool, of which one is scoured, and the other is in the yolk. The four last were cut by myself in the beginning of June from the shoulder and breech of two of my shearling rams. They have their appropriate marks, for the accuracy of which I will vouch; and I have only to request, that those who examine them will be so good as not to separate the pile more than is absolutely necessary; and that they will not take away a single hair of the wool. From this inspection, Mr. Williams " [author,

of a pamphlet entitled *An Address to the Woollen Manufacturers of Great Britain, &c.* ; whose opinions Dr. Parry has strongly controverted]” and the other sceptics, will have a competent opportunity of learning something of the nature of English wool, of which they so freely publish their ignorance. These gentlemen will also, probably, be surprised to see the little difference of length, closeness, and fineness, which there is between wool of the shoulder and of the breech ; and if they shall, on such an examination, decide which specimen belongs to its respective part, I will give them credit for their powers of distinction.

“ For their farther information, I may refer them to an entire fleece of raw wool, which is also (as it appears) the produce of a shearling ram of a mixed breed ; and which is exhibited to the Bath Society for the premium for fine clothing wool. The secretary has obligingly promised to show it to those who wish to examine it. I need not add, that the cautions expressed above as to the samples are peculiarly applicable to this entire fleece, which must go for final approbation to the general meeting of the society in December.”

I congratulate the public on the appearance of this small but valuable publication ; because I trust it will be the precursor of many such experimental tracts that will be afterwards produced by gentlemen who amuse themselves in their leisure hours with useful elucidations concerning particular departments of rural economy. From the want of these, this nation, and the world at large, has been wading in uncertainty for ages past in respect to the most useful objects. Perplexity

and doubt every where prevail; and prejudice and error have so firmly established their dominion, toward whichever side we turn us, that those who wish for information from books are misled ten times for once that they are set right. The world is inundated with the works of theorists and speculators; but a genuine account of experiments, conducted with caution, judgment, and steadiness, till fair conclusions can be deduced from them, is what we seldom meet with: when it does appear, it ought to be prized as a jewel of inestimable value. As such I view the present: nor let it be considered as an objection, that many facts on this subject still remain to be ascertained. He who settles any one point, does a great deal; for he lays a sure foundation on which others may steadily advance.

In return for the gratification that I have felt in the perusal of this performance, I beg leave to communicate to the author an easy and efficacious mode of destroying the tick (*hippobosca ovina*), which is an insect peculiarly hurtful to the thick-woolled Spanish sheep. The composition of tar and grease is effectual enough for wounds, but it is difficult to apply it properly where the animal is covered with its very close fleece. An extract of tobacco, made by boiling the stalks and leaves in water, if poured upon the middle of the back all along while the sheep is standing, and allowed to flow gently all over the skin till it wets the roots of the whole fleece, will seldom fail to kill the whole, without distressing the sheep in the smallest degree. The scab may be effectually eradicated by the same simple application: but where either of these maladies is very inveterate, the animal should be immersed in the liquid

till the wool be thoroughly wetted, and then the superfluous moisture squeezed out. This application may be made at a very small expence, if some plants of tobacco be reared in the garden, which every sheep-owner should do. For this purpose, no other nicety in the curing of it is necessary than to dry it without allowing it to be rotted. Some pains will be required at the first, to ascertain the proper strength of the extract; but this may be done by a few trials: what I myself used for this purpose with the happiest effect was obtained from a spinner of tobacco ready prepared. None of it should be allowed to go into the mouth, for it is a poison.

I beg leave farther to state on this occasion, that should any man, or society of men, have a desire to obtain a breed of Spanish sheep *properly selected* in respect to carcase, shape, and fleece, if they are willing to be at the expence of bringing them over, I can, by the intervention of a friend who has the means in his power, put them upon a plan of obtaining these selected sheep from Spain, without any risk of being subjected to inconvenience from the law prohibiting the exportation of live sheep from thence; and shall be ever ready to lend my assistance to them in that way, or any other that is in my power.

NATURAL-HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

[Continued from page 127.]

*On the transformations and habits of the *Æstrus aquæ Chamæleon*; the *Musca Chamæleon* of Linnæus. Syst. Nat. page 979, n. 3.*

THOUGH this insect in its vermicular state lives in the water, and undergoes its different changes somewhat after the same manner with that of the rat-tailed insects described in our last Number; yet it differs from them in many respects, and will afford us one other instance of the diversities that Nature admits in effecting her purposes.

The larva of this insect, like the former, is found in shallow pools of water, whether salt or fresh; in ditches, chiefly in those in which aquatic plants and mud abound, among which it seeks for its food, like the woodcock, rather by suction than by chewing; for though, upon a superficial view, it exhibits something like the movement of jaws about its mouth, that is only a deception.

In its general shape, this worm more resembles that of fishes than any other class of animals: its body grows gradually thicker as it recedes from the mouth, for nearly one fourth of its length; and, keeping that thickness for a short time, it begins again to taper smaller as it approaches the tail, which at the point expands in a manner somewhat similar to the tail fin of fishes. It has, however, no fins, nor scales; nor

does its body consist of one undivided whole, as in fishes, but, like other insects, it is divided by rings into parts, which are twelve in number. These rings are covered with a rough granulated skin of various colours, with the common accompaniment of spiracula, or air-holes, perforating them.

But what chiefly discriminate this insect from fishes, are, its attitude and movements. Instead of moving horizontally in the water, as fishes in general do, and with a considerable degree of agility, it affects a perpendicular position, and is slow in all its motions. It is found, in general, suspended in the water with its head downward, sometimes wholly at rest, with its tail spread open on the surface of the water, as in Fig. 1; and when it moves, it bends its body from side to side, and thus changes place.

From its affecting the position here described, it will readily occur to the reader, that, like the rat-tailed insects, this species also respire through the tail, which is, in fact, the case; but the *Musca Chamæleon* has no power of lengthening or contracting that organ. It is however endowed with the power of remaining longer under water than the former, and seems, therefore, more nearly to resemble the organization of amphibiæ; but it has the faculty of modifying air for its own purposes, in a manner different from any other animal that we know.

The kind of tail with which Nature has furnished this insect consists of a set of hairs, or rather filaments, that spring out all round the smallest part of its body where it terminates, in a circular manner. It has the power of contracting these filaments at plea-

188 *On the Changes of the Chamæleon Fly.*

sure, 'so as to make them bend in towards each other, after the same manner as you may conceive we could bend a series of fingers, were they placed in a circular fashion round a common centre, and thus to form a kind of hollow ball. When it wishes to descend, these filaments assume that form, as in Fig. 2; and then this ball is immediately filled with a globule of air, which appears through the interstices like a clear pearl. This bubble of air serves to keep the body still in its vertical position; but when it descends deeper, this bubble escapes, and rises through the water to the surface: it is succeeded, however, by another bubble, which once more fills the ball, and is suffered in its turn to escape, if the insect continues to descend; and so on, one bubble succeeds another, in the same manner (though in a much less rapid succession) as the air bubbles in Noodt's machine for impregnating water with fixed air. When the insect rises upward, the bubble in the tail is retained, so as to keep it still uppermost: but by what mechanism it has the power to lighten its body at pleasure, has never yet been explained: probably it is by means of an air-bladder like that of fishes, whose peculiar mechanism also has never, I believe, been attempted to be investigated. We can easily conceive, however, that this organ in fishes, which we call the swimming bag, or air vessel, consists of a series of muscles, which are capable of being strongly contracted, so as to compress the air within it into a much less bulk than it before occupied, without allowing any part of it to escape; or of being greatly relaxed, so as to allow it to occupy a much larger space; and if the other muscular parts of

the body participate of the same contraction and dilatation, it must occasion a greater or less degree of buoyancy at the will of the animal, and thus endow it with the power of rising towards the surface, or descending, at pleasure. However this may be, it is plain that our aquatic insect is endowed with the same faculty.

The head of this insect exhibits not less matter of curiosity than its tail. In the middle part of its mouth is placed a hard pointed horny-like substance, somewhat resembling the bill of a bird; and, like the upper mandible of most birds, that kind of beak admits of no movement; nor is there any thing here discoverable that resembles the lower mandible. In its stead, we discover two members, one on each side of the beak, which are capable of various movements, and which were naturally taken for moveable jaws, or organs connected with the beak for preparing the food to enter the stomach. These, however, upon a fuller investigation, were found to be organs of a very different destination, viz. the feet, by means of which this insect performs many of its movements in the water, and by whose aid alone it can move itself forward on dry land. Swammerdam, who first described this insect with precision, once believed, that it made use of its beak as a parrot does of its bill, to assist in its movements, and that this snout, so nearly resembling it, was an organ of the same sort; but a nearer examination convinced him of his mistake. He found reason to be satisfied, that this animal lives by suction, and that these members had no other connexion with the mouth than that of being placed very near to it,

He called them feet ; but if they had been denominated hands, it would have conveyed a more accurate idea of the functions they are destined to perform ; for, as this insect lives entirely in the water until it is about to enter into its nymph state, it has only occasion then to employ them as feet for drawing the body forward, which is trailed along very much in the same manner as a man's body might be dragged on by means of his hands. The principal use of these members during their period of existence seems to be to loosen the mud for the purpose of allowing the mouth to find easier access into it than it otherwise might do, performing in some measure the same functions in this respect as the gristle in the nose of the hog. From the position of these members, some fanciful people have said that this larva carries its feet in its mouth ; and if we were to judge from the ideas we derive from the contemplation of quadrupeds, the resemblance would be very exact ; for it has the power of drawing these organs inwards at pleasure, so as to be hid, as it were, within the cheeks. Others, from the same circumstance, have called them a double tongue : but these are notions derived merely from misconception.

The skin is covered all over with a kind of hard tubercles, which are too small to be distinctly seen by the naked eye, but, when viewed through a very high magnifier, appear as represented at Fig. 3 ; these, however, are much smaller where the rings join than elsewhere, which renders the body more pliant there. These tubercles are very hard, and might, as Swammerdam thinks, be employed as shagreen for polishing ivory and hard woods.

There are nine stigmata, or spiracles, on each side of this worm ; the three divisions wanting are, the 1st, to which is attached the head ; the 3d, where the wings are to be afterwards placed ; and the 12th, which is the tail division. These are of a darkish colour. Beneath these are several dark points of much smaller size, which seem to be of no use, but merely ornamental.

The skin is marked with three colours ; there are oblong dark stripes, spots somewhat lighter, and orbicular rings, from the middle of each of which springs out a hair ; there are also a few stronger hairs among them.

The tail consists of thirty filaments surrounding the extremity of the body, where two spiracles terminate. The anus, as in fishes, is higher up the body. From these filaments spring out others smaller, laterally. The skin from which these filaments originate is granulated as well as the rest of the body, as are the filaments themselves, though the granules are here very small. These filaments do not admit of being wetted, were they immersed ever so often in the water.

This is a calm inoffensive insect. It discovers no symptoms of fear when man approaches, and performs its usual operations with great tranquillity. It never attempts to hurt or annoy any other creature in this state of existence.

When the time of its grand metamorphosis approaches, the larva leaves the water, and, climbing up the sides of its banks, chooses a place where it can lie only in part immersed in the water : here it remains at rest, until it finally attains its pupa state ; but the changes it undergoes while in this state are very

192 *On the Changes of the Chamæleon Fly.*

great, and have been described by Swammerdam with an anatomical accuracy almost beyond his ordinary standard, in which we shall not attempt to follow him, but merely trace the principal outlines.

Soon after it ceases to move forward, its body begins to shrink in length, so as to leave the four rings next the tail entirely empty, and part of that at the head. This may be clearly perceived by holding it up between you and the light, where the empty parts of the skin become in a certain measure diaphanous. The skin is often bent in several directions, and it then assumes the appearance exhibited in Fig. 4.

The transformation thus far is effected with great rapidity, as the form of the nymph may be completely traced when opened up (as in Fig. 5) sometimes in thirteen hours from the time when it became stationary. It is then wrapped up in a kind of thin filamentous case, which it only quits when it has attained the perfect state of the fly : but, if this mantle be cautiously removed after its members have had time to acquire a small degree of consistency, it appears, when considerably magnified, under the form exhibited in Fig. 6, which we shall give as one specimen of the appearance that insects in general make when in their nymph state.

In this figure all the members of the future fly may be recognised, blocked out, as it were, in a rude form, and carefully folded up. They are now in a soft watery state, but by degrees become more firm, as they acquire their relative proportions. In this figure *a a* represent the antennæ, *b b* the eyes, *c* the proboscis, *d d* the first pair of limbs lying upon the breast, *e e* the second pair lower down ; beneath these, and in

part covering the third pair of limbs, *h*, you discover the wings crumpled up in various folds, which only expand after the fly has been for some time out of its case. When it first breaks its prison, this member (in all insects) is soft and moist, and adheres close to the body in many folds; but in a few minutes they unfold and expand to their full dimensions, becoming then dry and rigid. If the wings be wounded before they be unfolded, there issues from them a small quantity of colourless liquid, which may be deemed the blood of the insect, and in that case they never expand. If they be wounded after they have assumed their proper form, they cut dry like a piece of paper. At *g* are perceived some traces of the upper rings of the body, *k k k k* are the stigmata, and below them appear the same kinds of dark points, *i i*, that held the same position in the worm.

In the space of from five to ten, or eleven days, according to circumstances, the fly has attained its complete form and dimensions in all its members, as well as the colouring which Nature hath appropriated for it. Life, which seemed to have been for some time in a great measure suspended in the nymph, gradually returns. It becomes at last impatient of its prison, and makes efforts to escape from it. The original skin of the worm, having performed the office of a cocoon, has now become dry and brittle. In consequence of these efforts, that skin at length bursts asunder (always after the same manner); the third, fourth, and fifth rings giving way, allow the fly to make its exit, which, leaving its internal mantling behind, as well as the external case, now appears in

the form exhibited at Fig. 7. This fly has only two wings, and, like most other two-winged insects, it has under the wings a pair of balancers, which contribute to produce that humming noise it makes in flying.

The head, the corcelet, and the belly of this kind of fly, are more distinct from each other than in most cases, being connected only, as it were, by a thread. The eyes are two large ones, each a cluster of hexagonal facets of a shining brown colour verging to green, and three smaller, placed triangular-ways between them. The antennæ are dark-coloured, and have eight articulations. The base of the antennæ and fore part of the head are covered with short hairs, which are of a golden yellow colour; the upper part of the corcelet is scaly, and covered with short velvety hairs, with an edging of yellow towards the belly. The six legs are scaly, and covered with stiff hairs; the claws reddish; the rings of the body are scaly, of a dark colour, edged with yellow; and garnished with short hairs.

The properties of the fly itself are less known than that of the larva. Naturalists of the first eminence, Swammerdam, Reaumur, and Linnæus, are by no means agreed about what is its food. The first represents it as sucking the blood of cattle, and distressing them somewhat after the same manner as is known to happen with the *æstrus bovis*; whereas this fly is so much about the nature of its food, that the last has given it the name of Chamæleon, which it bears. There are some other particulars respecting this fly, in regard to which the two first named naturalists differ, concerning which I do not pretend to interfere.



The following remarks are communicated by an intelligent correspondent, whose favours I should be glad to have occasion more frequently to acknowledge.

I was led the last summer by an accident to inquire at what hour of the night or day insects emerged from the chrysalis state, and, for the sake of numbers, made my observation upon the silk-worm moth (*Phalæna Mori*). I find that at sun-rise precisely they all (alluding to that species) escape from their prison, and that, whether exposed to the light or confined in a dark room. I do not know an instance of one hatching after five in the morning till sun-rise the next day. The fact is curious; but what kind of influence operates upon them at that moment, perhaps is beyond our powers of discovery.

The liquor parted with from the mouth of the insect (which so instantaneously corrodes the cocoon) must be of a very extraordinary quality; for the silk is so protected by the animal gluten or gum, which constitutes a fourth part of its weight, as to resist in a great degree the action of any other fluid. Chemists say that this fluid is analogous to the acid of ants; but I believe it to possess some other quality, which has not yet been noticed; for aquafortis itself will not so instantaneously pervade that compact body. The same mouth fourteen days before produced the thread, which now ejects a liquor sufficiently caustic to corrode and destroy it.

My readers will recollect that Mr. Reaumur took notice of a circumstance of the same sort respecting

the time of the day that the Ephemera fly emerges from its prison (see Vol. III, page 29), which is always about nine o'clock in the evening. I make no doubt but the same kind of regularity takes place in regard to the time of the metamorphosis of most other insects, were they attended to with care. I therefore beg to recommend an attention to this particular to such of my readers as take pleasure in this department of Natural-history. Were the fact respecting this particular known in every case, it might possibly lead to useful economical discoveries that are not at present apprehended; for it might suggest efficacious means of eradicating some destructive kinds of insects, which at present wholly elude our power.

The fact taken notice of respecting the singular quality of the liquid emitted by the insect at this time deserves also to be very particularly adverted to, not only in this instance, but in many others; for there can be no doubt but the liquids with which insects are provided for the various purposes of their economy, are unlike in many respects to any other known substances in nature, and possess qualities that might on some occasions be of great utility and inestimable value, were they properly collected and employed for the uses they were fitted to answer. *Silk* is a striking instance of this nature. Many others perhaps of equal value remain yet to be discovered.

MISCELLANEOUS LITERATURE.

Hints calculated to promote the internal prosperity of this country, to augment its produce, and to alleviate the pressure of the present times with regard to the high price of provisions.

EVERY one will admit, that the number of horses kept at present in this country is in itself an evil of a very serious nature, which ought to be removed, if that can be done without producing a greater evil in its stead. These considerations induced me to offer lately (page 112) some hints, tending to show in what way this evil might be in some degree mitigated. What I have now to offer, in continuation of the same subject, will, I trust, afford satisfactory evidence, that it may be considerably diminished, without producing any obstruction to the internal commerce of this country, but the reverse.

This object has been already in part attained by the introduction of internal canals; but these, from the nature of the country, must ever be limited in their extent, because of the want of water to supply them, and other local circumstances. What I have now to offer is calculated to facilitate intercourse where canals cannot be applicable; and under proper management it may, perhaps, be made in some cases to supersede the use of canals where these are actually practicable.

The reader will easily conceive, that I here allude to rail-ways, a mode of forwarding weighty articles that has been long in use under certain local peculiarities, but which has not yet been introduced into general practice. At the first, these were employed solely for transporting coals, chiefly for a moderate distance, from the coal-pit to the place of shipping,

and were universally made of wood. Long had they been applied to this use, without any idea having been entertained that they could be employed for more general purposes. By degrees they were carried to a farther extent; the scarcity of wood, and the expence of their repairs, suggested the idea of employing iron for the purpose of improving these roads. At the first, rods of bar iron were nailed upon the original wooden rails, or, as they were technically called, *sleepers*; and this, though an expensive process, was found to be a great improvement. But the wood on which these rested being liable to rot and give way, some imperfect attempts were made to make them of cast iron, but these were found to be liable to many objections, until the business was taken in hand by Mr. Outram, engineer, at Butterly Hall, Derbyshire, who contrived at the same time so far to diminish the expence and improve the strength of the road as to bring them to a degree of perfection that no one who has not seen these can easily conceive could have been done.

This having been carried into execution in a few cases, and found to answer, has been improved upon and simplified by practice, till it is now brought to such a state of perfection as to have given proofs that it admits of being carried much beyond the limits of what was for many years conceived to be possible, and to afford demonstrative evidence, that it may be in future employed to a wider extent still, to which no limits can be at present assigned.

Rail-ways of this kind may be seen leading from Derby to the collieries in that neighbourhood,—five miles. 2nd. Crick rail-way,—one mile and a half, from the lime-rocks to the Cranford canal. 3d. Messrs.

Barber and Walker's rail-way from Biggarlee colliery to the Cranford canal,—one mile and a half. 4th. The Peak forest rail-way, from the lime-works near Boston to the canal near Whaley bridge,—six miles. 5th. The Marple rail-way, on the Peak forest canal,—one mile and a half. 6th. Rail-ways over Blisworth hill near Nottingham, on the grand junction canal,—three miles and a half long, double, just finished. 7th. The Ashby-de-la-Zouch rail-way,—four miles of double and eight miles single rails, not yet completed, but will be finished about Midsummer next. These rail-ways were executed nearly in the order stated, and those last mentioned are of course the most perfect. All in Derbyshire and its neighbourhood.

The best idea that I can give of the benefits that may result to the community from the use of this kind of rail-ways will be, to state some facts respecting them which were lately communicated to the Society of Arts in the Adelphi, by Mr. Wilkes, of Measham near Loughborough in Leicestershire; a spirited and judicious agriculturist, whose name is well known to all those who attend to rural affairs in this kingdom. Mr. Wilkes had a rail-way of this sort made, which was about five miles in extent, leading from a coal-mine to a market. He found it so fully to answer his expectations after it was finished, that he communicated to the Society of Arts, &c. an account of some trials that he had made of it, requesting that such of the members of that respectable institution as were desirous of information on that head, would do him the honour to witness some experiments that he wished to make upon it, for the information of the public. A committee of the members was accordingly deputed

for that purpose, and before them he showed that a moderate-sized horse, about twenty pounds value, drew upon it with ease down hill (the descent being one foot in a hundred) thirty-two tons, and without much difficulty forty-three, and seven tons up-hill, independent of the carriages. I conclude from these facts, that upon a perfect level a horse could draw with ease from ten to twenty tons. [N. B. Mr. Wilkes's railway, on which the experiments were made, was, from local circumstances, laid upon wooden sleepers, and is not so perfect as those done upon stone.]

But twenty tons is the load which such a horse could draw with ease, travelling at the usual waggon rate, in boats upon a canal; so that the number of horses required in this way will not be much, if at all, greater than on a canal. Certain advantages attach to this mode of conveyance which do not so well apply to a canal, and *vice versa*: but it is not my intention to draw a parallel in this place between these two modes of conveyance. Nobody can entertain any doubt about the utility of canals where they are easily practicable. I only wish to point out this as an eligible mode of conveyance where canals cannot be conveniently adopted.

It was customary at the first, to put the whole load to be drawn by one horse upon rail-ways into one waggon; but now, when the load is so much augmented, it has been found eligible to divide it into many parts, so that no one waggon shall carry more than one or two tons; by this method the weight is so divided, that the pressure is never so great upon one point as to be in danger of too much crushing the road; the carriages can be made much more limber

and light in all their parts, on the principles I mentioned in my last; and they are much more easily moved, and more manageable in all respects than they otherwise would have been.

Another advantage of this arrangement, which deserves to be particularly adverted to, is, that it admits of shifting the carriages, so as to leave a load, as it were, in parcels at different places where they may be required, without trouble or expence. This, when it comes to be fully understood and carried into practice, will be a convenience of inestimable value, a thing that has been always wanted, and never yet has been found, though it has been diligently sought for. It is of importance, therefore, that I should here take some pains to illustrate the nature of it.

When the wet docks on the Isle of Dogs, for example, shall be finished, it will be found, that a considerable part of the goods there landed will require to be transported to London; a distance which may run from two to seven miles; a commodious road for transporting these goods at as small an expence as possible will of course be wanted; and, from what has been said, nothing could be so eligible as a rail-way, should that be found practicable.

Upon the principle of a canal, it would be easy to make a rail-way, on which all the goods could be commodiously transported to one fixed point, from whence each individual parcel might be forwarded to its separate place of destination upon carts along the streets. The difficulty of packing and repacking, of separating and reloading, is, however, such as to render it doubtful whether it would be worth while to adopt that mode of conveyance for the distance of two or three

miles only. By the contrivance I now hint at, this difficulty may be easily and completely removed.

Suppose a rail-way were brought from the wharfs to Bishopsgate Street, or any other more commodious part of the town; and supposing all the waggons to be made of one size and form, each capable of containing one ton of sugar, or other goods of similar gravity. Let the body of each of these waggons be put upon a frame that rests upon the two axles of four wheels that are calculated to move only upon the rail-way; and let each of these waggons be loaded with goods that are to go to the same warehouse, or its vicinity. The whole of the waggons being thus loaded, they are moved forward till they come to the end of the road, at which place it should be made to pass under a crane. When a waggon comes under that crane (or, for the sake of expedition, a crane may be provided for each waggon); let it be lifted up from the frame, and transferred at once by the crane to another similar frame that rests upon wheels, formed for going along the streets, to which is attached a pair of shafts for a horse to move in. The carter has then no more to do, than to go off with his load (which is just a proper one for one horse) to the street and house to which it is directed; from whence having unloaded it, he may return directly with the empty waggon, where it can be lifted from the wheels by another crane, farther on than the unloading crane, and still above the rail-way, on which it can remain suspended until an empty set of rail wheels shall come to receive them; these return-waggons, whether full or empty, are then lowered down upon the rail wheels, and taken back to the wharfs, and so on.

Nothing surely can be more easy, or more simple, than this arrangement; and, if the rail-way were carried forward along the skirts of the town in a direction that should be found convenient, until it reached the Paddington canal, having delivering cranes as above described at every principal street as it passed, goods might thus be distributed all over the town with the utmost conveniency and economy, or sent forward by the canal to distant places; and goods coming from the canal could, in like manner, be distributed to the town, or taken to the wharfs, as circumstances might require.

It appears to me, therefore, demonstratively certain, that nothing could be more eligible for the accommodation of London in the present state of things, than a rail-way upon this plan; and I humbly beg leave to suggest it to those concerned, as an improvement of the first importance.

In this case, as indeed in all others where much business is to be carried on, two parallel rail-ways would be wanted, one for going, and the other for returning, so as not to interfere with or interrupt each other.

On the same plan, it is certainly very practicable to carry roads of a similar kind from London to Bath, and every other part of the country. All that would be necessary would be, to get surveys made so as to ascertain the most eligible direction; for the road should in all cases be made to go in a direction as level as possible, or at least as far upon one level as could be rendered convenient, rather making the rise or fall at one place, than dividing it into a great many ups and downs, as is too often the case at present in ordinary

roads ; in short, they should follow, in this respect, the principles of a canal : for it would be easy to keep a proper number of horses for assisting at such pulls, and doing nothing else. An act of parliament must, of course, be obtained for these when wanted, as for a canal.

The convenience of such roads would be very great, from the circumstance of having separate moveable waggons, as above stated. One separate waggon, or more, could thus be left at any place on the road, and others taken up in their stead, like passengers in a stage coach, without deranging the others. Farmers too, near these roads, could thus send their corn by that means to any distance that they might find convenient, and get back in return manures, or goods of any sort that they might want, with perfect safety, each person having his own waggon, if he so chose it, covered and locked, so as to be opened only by those who have the key.

It is unnecessary to enlarge on the benefits that would result from these arrangements, for they are obvious ; nor need we enter here into a detail of the means of removing *little* difficulties that would occur in trying to bring it into use. These are trifling, and might be easily obviated, were this a proper time for entering upon these discussions, which it is not. I shall, therefore, content myself with suggesting a few remarks tending to show the practicability of the measure, and to guard against setting out upon a bad plan, which might in time come to frustrate the good that might have resulted from the undertaking ; merely premising, that I propose these rail-ways solely for the purpose of conveying weighty loads, leaving the roads, as at present, open for coaches and light carriages.

With a view to discover how far it may be practicable to introduce these iron rail-ways into general use, I have made some inquiries respecting the expence of making them; and, although this must vary according to the abundance and goodness of materials, and other circumstances, yet the following statement may serve to give some general notions on that head. In the most favourable situation, where materials are abundant and good, and circumstances favourable, the lowest expence at which a *single* rail-way of this sort can be made will be about one thousand pounds a mile. But as a *single* rail-way must be liable to great inconveniences, unless under very particular circumstances, double rail-ways ought to be considered as the only useful sort. These, for public purposes, according to the opinion of the inventor, should be very substantially made. The metal used should be of the stoutest sort; and of substance enough, not merely to carry the weights proposed, but to be equal to bear almost any blow or shock that they may be likely to experience; and, thus made, what they will lose by rust or wear will be long ere it materially weakens them. Made after such a manner, in favourable situations in the country, a double rail-way may cost about two thousand pounds a mile; but in the neighbourhood of London, where the charge of every thing is high, and where they should be of the strongest sort, we shall suppose they might cost nearly three thousand pounds a mile. It is bad economy to save on articles of this sort at the first; for a little expence thus laid out then will save much in repairs: how small these repairs are, may be imagined from this circumstance, that when a road is thus made, the undertaker does not

scruple to supply all that are broken, free of charge, for the first three years.

Say, then, that such road cost three thousand pounds a mile. This would bring a charge upon the turnpike of 150*l.* a year; say 50*l.* more for annual repairs; this is, in all, 200*l.* per annum. Compare this with the expence of keeping the present roads in repair.

I have been assured, and believe it to be true, though I cannot pledge myself for the certainty of the fact, that there is annually laid out on repairs upon the road from Hyde Park corner to Hounslow considerably above one thousand pounds a mile; so that the difference of expence is, even at the beginning, very much in favour of rail-ways: and were the money thus at first expended to be gradually paid off, the tolls might thus be lowered almost to nothing.

A turnpike road cannot be made in almost any situation for less, as I am told, than 1000*l.* per mile; but where it is of considerable width, as near great towns, it will run from 1500 to 2000*l.* per mile; and in annual repairs, including the purchase price of materials, carting them on the road, spreading, raking off, and carting away again, from 100 to 1000*l.* a mile. Say 1500*l.* prime cost, the interest is 75*l.* and 150*l.* for repairs, the annual charge of such road will be 225*l.* This is an expence of 100*l.* a year more than the other. But for the present, let us suppose that they will be equal, the extra charge for purchasing ground for a new waggon-way, &c. being equal to that surplus; let us now see what would be the difference of charge to the employer of these waggons in the two cases.

Supposing the road to be so much employed as that 100 waggons (or loaded carriages to the same amount)

pass each day, carrying 6 tons each, drawn by 8 horses; these, at one shilling each waggon for toll (or twopence a ton), would produce 5l. a day, or 1825l. a year; which, at the rate of 8 miles for each turnpike, would be 228l. per mile, the surplus being produced by road horses and light carriages. The charge then to the employer, for this stage, must be 1825l. and the keep of 800 horses, besides servants, incidental charges, and owner's profits for the transporting of 600 ton of goods a day. Say that the same horses travel two stages a day, the turnpike money would be doubled; that is, 3650l. per annum; the keep of 800 horses at 2s. each *per diem* is 29,200l. These sums added make 32,850l.; owner's profit and incidental charges, say 10 per cent. 3285l. in all, 36,135l. or, on 219,000 ton (being 600 ton a day) about 3s. 4d. per ton.

Supposing the same quantity of goods carried on the rail-way, and the same turnpike money paid, and that each horse drew only fifteen ton, this would require only 40 horses; the keep of which, at two shillings a day, would be 1460l. add the toll, 1815l. is 3285l. per annum. Owner's profit, &c. upon this sum 10 per cent. as above, 328l. in all, 3613l. or about fourpence a ton, just one tenth part of the charge in the other case.

When the object comes to be considered in this point of view, few measures that can be proposed will hold forth such an important national improvement as this would be. Considered with regard to the consumption of the produce of the earth (an object at present deserving the fullest attention, as this improvement can be applied to almost every part of the country), it would reduce the number of heavy road horses to one eighth part of what they are at present, and

of course augment the number of cattle or other consumable provisions in a proportionate degree, so as greatly to lower the price of the necessaries of life. It would, in the next place, lower the price of the carriage of goods of all kinds to an amazing extent; and lastly, as a consequence of that, it would give such encouragement to agriculture, as no other measure that can be contrived could ever effect, and that without costing one shilling expence to any one individual or to the state. On the contrary, by inducing cheapness of provisions, and affording such efficacious encouragement to manufactures and to agriculture, it would produce a general prosperity, which, by augmenting the consumption of taxable commodities, would augment the public revenue; while, at the same time, every individual would feel himself relieved from the pressure of many taxes that prove distressful to him at present. This is a striking example of those kind of contrivances which an able financier, in my acceptation of the word, ought to study to devise; not those little delusive arts which consist in squeezing the heart's blood from those who are disposed to be industrious and sober.

But while I thus hold up to view a clear and obvious mode of promoting the public prosperity to a great amount, I am at the same time aware, that I lay open a tempting bait to the avaricious money-holder, who will contemplate with a greedy joy the opportunity that is thus presented to him of augmenting his already too abundant stores, unless he shall be prevented from doing so. Let me then beseech my countrymen, in the most earnest manner in my

power, not to suffer this ever to become a source of gambling traffic, similar to that which has taken place to such a vast extent in this country with regard to navigable canals. This evil has now become of such immense magnitude, and can be so managed as to be made such a tempting snare for unwary speculators, while it is such a certain means of augmenting the wealth of the monied jobber, as to call for the most strenuous exertions of every well-disposed mind to repress it.

Every one knows, that from the hopes which are often held out of the high profits that may be derived from canal adventures, many weak and heedless persons, who have not the money to advance, are induced to become subscribers, in the hope that the price of shares will rise, when they will be able to sell out with profit. In what respect does this kind of speculation differ from that other which all mankind concur in reprobating under the name of *stock-jobbing*, unless it be that the last is usually confined to a set of artful, knowing, and too often unprincipled persons; whereas the other extends to ignorant well-meaning people, who on some occasions may be said to be *swindled* into the persuasion that they ought so to act, by persons who lie in wait to profit by their inexperience. It is well known, that though a canal speculation may be, in the main, a very beneficial project, that will in the end afford even an usurious profit to the sharers to such a degree as ought never to be permitted in a wise state; yet it frequently happens that some unforeseen incident takes place, in consequence of which the money subscribed falls short, and the project is

stopt, perhaps for years, without a possibility of deriving any advantage whatever from it. Those among the subscribers who have money, or others who could push it forward if they would, so far from stepping forward under these circumstances, to relieve the others, quietly lie by till they see those who have not money to spare, obliged to sell out under these depressing circumstances at a loss, perhaps, of 40, 50, or 80 per cent. of their whole capital, to their own ruin. This is the harvest of these monied gamblers, and they take care to manage it with a dexterity that would well become a better cause. They thus, without compunction, make purchases that, under other circumstances, would excite the most horrible detestation. In this way sir Hugh Middleton, the contriver of the New River at London, died in the most pitiable want, from the losses he sustained by forced sales to men who at this moment draw, if I be rightly informed, no less in some cases than ONE HUNDRED per cent. per annum for the purchases they then made; nay, I am farther assured, that there are some owners of old river navigations in Yorkshire, who divide upwards of two hundred and fifty per cent. profit per annum on the price that they paid for the shares they hold; that is to say, they draw two hundred and fifty pounds a year for what originally cost them only one hundred pounds.

Such a mode of carrying forward public works of the nature of those in question is highly pernicious, because, in the first place, it has almost a necessary tendency to distress many individuals, and proves at length ruinous to their families and connexions. In

the second place, it gives rise to a spirit of gambling, that tends to enrich still more, adventurers, who have already but too great a share of wealth. Contrary to the Latin precept (*parcere subjectos*) it pulls down the poor and exalts the rich. Not only does it produce these evils *at the beginning*, but it continues to shed its baneful influence over all succeeding ages, by retarding the prosperity of the country in order to add to the unjust gains of individuals; for whatever tends unnecessarily to enhance the price of the transporting of goods must inevitably produce this effect. From all these considerations, I cannot behold any extension of this species of canal gambling without a strong sensation of horror.

To guard against these evils, all that is necessary is, to prevent these rail-ways from ever becoming *private property* on any account: to keep them open and patent alike to all who shall choose to employ them as a king's highway, under such regulations as it shall be found necessary to subject them to by law. In short, they should be put upon the same footing in all respects as public roads are at present, only under the direction of a distinct set of commissioners, who should have the superintendence of every thing that concerns this species of roads only. These commissioners should be vested with authority under an act of parliament, to erect turnpikes upon them, to levy certain stipulated tolls, and to mortgage the produce of these tolls for the purpose of raising money to be applied in the necessary purchases of land, and making the roads. In the act it should be expressly stipulated, that the produce of these tolls should be applied solely to keeping the road in repair, paying the interest of

sums borrowed, and clearing off the principal as fast as the collections would admit; and when the whole money borrowed was thus paid off, the tolls should be so lowered as only to produce money sufficient to keep the roads in a state of continually good repair. Thus would the expence of transporting goods be annually diminishing, and the prosperity of the country be thereby augmenting from day to day.

I am more earnest on this account, perhaps, than most persons will think reasonable; but that is because they are not so much aware of the consequences of these things as I am. I have not been an unconcerned observer of the effects that have resulted from the establishment of turnpike roads in Scotland, which were begun within my recollection; and these effects have been such as no man who had not seen it would have believed could ever have taken place. Distance may be said to be thus diminished from place to place; lands that were originally far beyond the influence of the town as a market for any thing else than live stock, are thus brought, as it were, close to its gates; and the value of the produce of many articles is thus to them augmented fourfold, while they are at the same time diminished to the public. Not only is the value of produce raised, but the quantity also of that produce is augmented exceedingly by means of manures which become then accessible. Fossile manures, such as chalk, lime, and marle, which were formerly confined to a narrow spot, expand themselves as if it were by a magical power, and by that expansile influence diffuse around fertility, riches, and plenty. Coals, and other weighty articles that may be useful in arts or manufactures of various kinds, which never were, nor ever

could have been of any value to the owners of them so long as the expence of transport exceeded a certain sum, find a ready market to any extent as soon as the price falls below that rate ; thus contributing not only towards the enriching of the owners, but to the furnishing of employment to the various persons who must be engaged in preparing and transporting them to market, and the universal accommodation of the whole. Around every market you may suppose a number of concentric circles drawn, within each of which certain articles are marketable, which were not so before, and thus become the source of wealth and prosperity to many individuals. Diminish the expence of carriage but one farthing, and you widen the circle ; you form, as it were, a new creation, not only of stones, and earth, and trees, and plants, but of men also, and, what is more, of industry, of happiness, and joy. The man who can contemplate these things without feeling his bosom glow with an enthusiastic warmth deserves not the name of a social being. Without such sensations, life itself would be a boon not worth the coveting.

By making these roads the property of the public, and free to every person to bring his own waggons upon them wherever he pleased, farmers, when near them, would make bye roads of the same sort leading into these from their respective premises ; the inhabitants of villages and country districts would join together, and at one common expence make roads of the same sort leading to a greater distance inwards, as they now make bye ways for themselves. Thus would all be accommodated : those who had business enough to furnish a sufficient load for one horse might go to

market with it when they pleased ; those who had dealings on a smaller scale could have one, two, or more waggons of their own conjoined with those of others to make up a load for one horse ; and those of still smaller means could have one waggon loaded with the joint articles belonging to two, three, or more. A ton weight might *then* be pushed before a man to market for many miles, as a wheelbarrow is now. It is scarcely possible to contemplate an institution from which would result a greater quantum of harmony, peace, and comfort, to persons living in the country, than would naturally result from this arrangement. I cannot therefore too warmly recommend it to the attentive consideration of every individual who shall read this. Let him not take the above stated facts upon my authority, but scrutinise them with the most rigid attention, so as to be sure that he cannot be deceived. Let him not rely upon my reasoning as to the result, but ponder it well in his own mind, and consider it under every point of view, comparing it with facts of a similar kind that fall under his own notice : and then let him draw the conclusion for himself. By acting thus, he will do all that I could wish at his hand.

I myself know no *one* measure that would tend so effectually to lower the price of the necessaries of life, and to restore abundance once more to this island, than that which is above proposed ; but I am far from thinking that this is all that ought to be done. The derangement that has taken place in the political economy of this country, in consequence of the injudicious fiscal regulations that were adopted about thirty years ago, and persisted in since that time with a de-

gree of pertinacity that appears to be astonishing, when facts that were foreseen and foretold nearly at the time these alterations took place, speak a language so strong, that one would think, "he who runs might read;" yet prejudices, when once adopted, are so strong as to incline men too often "to shut their eyes against the clearest light." Under these circumstances, the voice of a nameless individual is disregarded; and he is reduced to the necessity of lamenting in silence the infatuation which he sees makes them behold with indifference the accelerating approach of events big with future evils. Such has been the case with the writer of these pages. For more than twenty years past, he has marked with a painful anxiety the gradual approaches of that scarcity which now overwhelms us. He thought it his duty to warn his countrymen of the evil that was approaching—his voice was disregarded—he then remained silent—but now, when the whole nation is suffering so cruelly by that distress, he thinks it is not impossible but what he shall say on that head may be more attended to; especially when he considers that the reader may so easily satisfy himself, if he chooses, that these observations are not suggested by the events of the present day, but were foretold when no appearance of the present calamity existed [see *Observations on National Industry*, letter XII. P. S. Robinsons], as the natural and necessary result of the measures that were then adopted. When facts thus corroborate reasoning, they ought to give to that reasoning a degree of weight that the insignificance of a writer could not alone ensure. Emboldened by that consideration, I feel a wish once more to turn the

attention of the public to the real causes of that distress which now overwhelms the nation, in order that efficacious measures may be devised for operating, as far as is now practicable, the radical cure of this evil, and guarding against the recurrence of a similar distress in future; instead of perplexing the nation with a set of inefficacious palliatives, which can tend only to excite private animosities and public disturbances, in consequence of the irritation of mind that a frequent recurrence of disappointment, where relief was hoped for, must so naturally produce. I have it in contemplation, if health permit, to prosecute this subject in some future number of this work. I am sorry to say, that it will then be found, that one false step, when committed in affairs of this kind, may require a hundred to restore things to their pristine state: sometimes it becomes entirely impossible. The maid who has made one false step never can recall it—and somewhat approaching to this often occurs in the science of political economy.

On the Art of Reasoning.

Few calamities are so oppressive to a nation, as the disease of governing *so much*, when it takes firm possession of the minds of those who have the principal power in the state.

I CANNOT recollect to whom I am indebted for the excellent maxim which I have here quoted; but I know that it was suggested by a view of the effects which had resulted from the regulations of Leopold, duke of Tuscany, who, about twenty years ago, tormented himself and all his people by the incessant

gree of pertinacity that appears to be astonishing, when facts that were foreseen and foretold nearly at the time these alterations took place, speak a language so strong, that one would think, "he who runs might read;" yet prejudices, when once adopted, are so strong as to incline men too often "to shut their eyes against the clearest light." Under these circumstances, the voice of a nameless individual is disregarded; and he is reduced to the necessity of lamenting in silence the infatuation which he sees makes them behold with indifference the accelerating approach of events big with future evils. Such has been the case with the writer of these pages. For more than twenty years past, he has marked with a painful anxiety the gradual approaches of that scarcity which now overwhelms us. He thought it his duty to warn his countrymen of the evil that was approaching—his voice was disregarded—he then remained silent—but now, when the whole nation is suffering so cruelly by that distress, he thinks it is not impossible but what he shall say on that head may be more attended to; especially when he considers that the reader may so easily satisfy himself, if he chooses, that these observations are not suggested by the events of the present day, but were foretold when no appearance of the present calamity existed [see *Observations on National Industry*, letter XII. P. S. Robinsons], as the natural and necessary result of the measures that were then adopted. When facts thus corroborate reasoning, they ought to give to that reasoning a degree of weight that the insignificance of a writer could not alone ensure. Emboldened by that consideration, I feel a wish once more to turn the

attention of the public to the real causes of that distress which now overwhelms the nation, in order that efficacious measures may be devised for operating, as far as is now practicable, the radical cure of this evil, and guarding against the recurrence of a similar distress in future; instead of perplexing the nation with a set of inefficacious palliatives, which can tend only to excite private animosities and public disturbances, in consequence of the irritation of mind that a frequent recurrence of disappointment, where relief was hoped for, must so naturally produce. I have it in contemplation, if health permit, to prosecute this subject in some future number of this work. I am sorry to say, that it will then be found, that one false step, when committed in affairs of this kind, may require a hundred to restore things to their pristine state: sometimes it becomes entirely impossible. The maid who has made one false step never can recall it—and somewhat approaching to this often occurs in the science of political economy.

On the Art of Reasoning.

Few calamities are so oppressive to a nation, as the disease of governing *so much*, when it takes firm possession of the minds of those who have the principal power in the state.

I CANNOT recollect to whom I am indebted for the excellent maxim which I have here quoted; but I know that it was suggested by a view of the effects which had resulted from the regulations of Leopold, duke of Tuscany, who, about twenty years ago, tormented himself and all his people by the incessant

abolitions of his inveterate desire to regulate every thing by law : yet the *man* of this prince, like that of Don Quixote, was of the most beneficent kind, inasmuch that those even who suffered by it could scarcely find in their hearts to complain. Misery, however, was the result of these ill-judged, though humane regulations, and universal discontent its necessary consequence, as it ever must be in cases of the same kind.

I know nothing that is so fallacious as human reasoning : and therefore its decisions ought ever to be listened to with the most cautious circumspection. The knowledge of man is extremely limited : in no instance does any one know enough to enable his reason to decide with absolute certainty. He can see only a few things with his own eyes ; and even of these few he has not time or opportunities to examine any with that degree of accuracy which alone can preclude the possibility of being mistaken ; he must rely on other persons for the great part of his information, and he has no certain means of ascertaining the degree of credit which he ought to attach to the representations of each. Innumerable are the temptations that may occur to induce individuals to disguise or pervert the truth ; and if his information be false, the conclusions that his reason can derive from these data must, of course, be erroneous. A prince then, or a legislator, when he is called upon to enact restrictive laws, and surrounded by crowds of people of this description, cannot be so aptly compared to any thing that I know as to a blind man, who is under the necessity of trying to advance in a difficult path abounding with trouble-

some obstructions, and surrounded with pitfalls, which must prove his destruction if he does not avoid them : if he makes use of a staff, advances at a moderate pace, and gropes his way with caution, having his attention continually awake to discover when at any time he has made a false step, then to stop, and examine with care the nature of the objects that surround him, he will in time discover where he has gone wrong ; and some compassionate observer will, perhaps, kindly lend his aid to put him once more in the right path, even were it only to bring him back to the place whence he set off. But if, instead of this cautious procedure, which a due consciousness of his own defect should inspire, he shall vainly throw away his crutch, and attempt to walk boldly on in his own strength, what can be expected, but distress upon distress, and accumulated ruin ? The only infallible conclusion, then, that man can draw from his reason, is, that the grounds on which he must decide, when he is called upon to enact regulating laws, are so obscure as to afford him at the best only a probability that he may be right ; so that he ought at all times to proceed with a cautious moderation, and be ever attentive to notice such facts as may at any time give indications that he may have been wrong ; that thus he may be enabled to relinquish his errors, and get once more into the true road.

If such be the case with even the best intentioned legislator, who is at pains to inform himself as well as he can before he proceeds to act, what must be the case with regard to those persons who, in the most difficult cases, take it upon them positively to decide,

on the impulse of the moment, without any previous knowledge or investigation of the subject which they pretend to regulate? What, but the wildest chimeras that might disgrace a bedlamite seriously to utter? To what, indeed, can such men be compared, but to a lunatic, whose fancy produces a new creation, which he regulates at will? A feather in his hand shall be in his estimation a sceptre, by the waving of which whole nations shall be awed into submission; a few straws a crown, before which thousands of nobles prostrate themselves with the most humble submission. In short, no absurdity can be so great, as not to appear reasonable in the eyes of such men.

These reflections have been suggested to me by attending to the conversation that too often occurs in public and private companies at the present moment respecting the price of grain, the deficiency of the crop, the causes of these evils, and the means of remedying them. To these discourses I have often listened with a silent astonishment: an astonishment sometimes mixed with pity, when I found men of considerable talents in other respects, talking like lunatics on the particular subject of their craze, and uttering the most extravagant nonsense, though on other topics they discovered themselves to be reasonable men. Long was it before I could account for this kind of partial insanity; but at length the solution above given appeared to me to be a satisfactory explanation of it.

To talk to men when they are in this paroxysm of folly, would be madness; yet it does not seem to be improper to put those on their guard against it who have not been previously attacked by this disease,

Few arguments will be required to convince those who are in the right use of their senses, that facts will, on a superficial view, often appear to be extremely different from what they really are, and that therefore the judgment that may be formed upon these must be erroneous. For example :

I presume that few propositions will be more readily assented to by most men as undeniably true, than that if upon a fair investigation, accurately made, it should be clearly proved by undoubted evidence, that the present, or any other crop proved deficient to the amount of one *fourth* of an average crop ; that is to say, of a crop that would be sufficient to maintain all the inhabitants of this island for twelve months, and no more ; in that case no deficiency could be experienced if as much corn should be imported as would sustain all the inhabitants of this island, at the rate of their ordinary consumption, for the space of three months (which is exactly one fourth of the year). This proposition seems to be so plain, that I suppose no person who has never previously adverted to the subject will refuse to assent to it, but would probably be disposed to say that any one who should pretend to deny it was out of his senses. Yet the fact is, that the proposition is false ; and I shall prove it beyond the possibility of doubt.

Let us assume, by way of illustration, that the total amount of an average crop, that will serve the people of Britain for one year, is one hundred, be it tons, or millions of tons, or quarters of wheat.

Deduct from this average crop, on account of the acknowledged deficiency, one fourth part, which, by the supposition, would be 25. It would then follow,

if the proposition be just, that the deficiency of this crop would be fully supplied, and no more, if 25 quarters were imported, and that this quantity of corn would precisely serve the people for three months. This statement seems to be fair, and you assent to it; yet it may be fallacious:

For not only must you deduct from this crop the deficiency, which is admitted to be one fourth, but also the seed that is required for producing the next crop: and here we must allow, what I am sorry to state, but what I am afraid we shall all be obliged to admit, that, taking England all over, an average crop does not amount to more than *four times the seed*: but by the supposition, the average crop being one hundred, the proportion that ought to be set apart each year for seed will be twenty-five (and rather more seed ought to be allowed in a bad year, owing to its inferior quality), which, added to the twenty-five of deficiency, makes in all *fifty*. If you admit this reasoning to be fair, the conclusion appears to be obvious; viz. that whenever there occurs a deficiency of one *fourth* part in the amount of the gross produce of the country, there will be then experienced an actual deficiency of food to the consumer, not of one *fourth* only, but of *one half* his ordinary consumption; and that therefore there would require to be an importation in this case of *fifty* instead of *twenty-five* quarters, as it appeared to be on the first view of the subject! This also appears to be fair reasoning.

I beg leave, however, to recall to the attention of the reader, that I state these calculations merely as examples of the extreme danger of trusting to reasoning in cases of this sort, and therefore of the necessity

of being particularly cautious how we rely upon such a rule alone as a guide for decisive measures. The conclusion above, though to most readers it may seem to be as fair as could be wished, is still very erroneous.

Before we can ascertain with precision the amount of the consumption in an ordinary year, we must first deduct the amount of seed; this, upon a hundred, as above stated (one fourth), is twenty-five; of course the quantity consumed in an ordinary year is not one hundred, as above stated, but seventy-five only. This brings the monthly consumption to six and one fourth; of course the supply required for three months would not be 25, as above stated, but $18\frac{1}{4}$ only, and for six months $37\frac{1}{2}$.

From the 25 however that remained after deducting the fourth part of the gross produce of an average crop of 25 (for the amount of seed and the deficiency are in this case the same) as the admitted deficiency, we must still farther deduct the average 25 for seed. This 25 then is the absolute and true deficiency of the crop in the present instance. To discover what proportional deficiency this occasions to the consumer, we must divide 25, the total deficiency, by $6\frac{1}{4}$, the quantity consumed in one month; this gives 4; so that a deficiency of four months consumption will in this case be experienced.

We are thus at last brought to the fair conclusion, that when a deficiency takes place to the amount of one fourth part of the gross amount of an average crop, the consumers will experience a failure in that case, not to the amount of one fourth of the net consump-

tion in an ordinary year, as it appeared under one point of view, nor of one *half*, as it appeared under another statement, but of one *third* part of the average consumption precisely.

I beg pardon of the reader for detaining him so long with these tantalizing calculations. It was done merely with a view to show how easily even a well-intentioned writer may slide into error himself, when he relies too implicitly on speculations of this sort; and, at the same time, the great facility which this mode of procedure affords for deceptious writers to embarrass a question when it suits their purpose, and thus, without any real foundation, to excite hopes, or awaken fears among the multitude, and lead to error and public distraction in difficult times. What a lesson of caution ought this to afford to those who listen to the exaggerated harangues and artful statements of party-men of all descriptions !

But if it be thus difficult to avoid being led into error by the delusive seductions of reasoning, even where the facts are open to inspection by any one who chooses to investigate them with the requisite attention, as in the above example, how much more difficult must it be to persevere in the right path, in cases of this sort, when reliance is chiefly placed upon reasoning, where the facts upon which that reasoning turn are liable to be misrepresented or misunderstood ! I must then repeat it, that in matters of such serious concern as the providing of food for a whole nation, it becomes necessary to act with the most cautious circumspection, or the consequences may be fatal.

Innumerable, indeed, are the mischievous conse-

quences which result from hasty and ill-digested, though often well-meant exertions of individuals and legislators entering rashly upon plans for relieving distress in times of scarcity, of which many instances might be adduced. I shall beg leave to specify one of this sort, that came within my own knowledge, and was attended with deplorable effects at the time; nor has it yet been forgotten in the place where it happened.

The late lord Macdonald, who possessed large domains in the isle of Skye, in an ill-judged fit of philanthropy, hearing that the people in the island were in danger of being in want of corn in the year 1782-3, purchased at Greenock a considerable quantity of oatmeal, which he ordered to be sent round to his estate, and there sold below prime cost to the poor; in the whole, he thus expended several hundred pounds. This supply chanced not to be sufficient for the wants of the whole island; and when it was gone, none other being there to be had, the people experienced an extremity of want that had not in the memory of man been experienced in that island. His lordship, supposing that I had alluded to him in some part of my *report* to the lords of the treasury in the year 1785 concerning the fisheries, came up to me, and in some warmth taxed me with having misrepresented him in that report. I said, that I was not conscious of having misrepresented any person whatever in that memorial; and if he could point out a single statement in it that was not strictly consonant with truth, I should think myself much obliged to him, as I might have an opportunity at that moment to correct such statement before the committee of parliament, which was then sitting where we were.

This, he said, he could not do (in fact I had stated nothing respecting him), but he then asked me if I knew that he had expended many hundred pounds on the poor in the year 1783. I told him that I knew it well, and I knew also (although I did not impute blame to him for it, because it was certainly not so intended) that it had been one of the most destructive boons that ever had been conferred on that country. "What do you mean?" "Did you send as much meal as was sufficient to supply the wants of the whole island?" "No, I only sent as much as was sufficient to supply the poor on my own estate, to whom I sold it below prime cost. Others were able to pay for it themselves, and had no need of my assistance. James Macdonald (a merchant in Portree, in Skye) could supply them as he used to do." "And so he would have done on this occasion, had it not been for your lordship's interference. You know very well that James Macdonald could not afford to sell unless for a fair profit; but, if he had attempted to sell it at a rate that could afford him a living profit, while yours was selling at his door so much below that price, what would have been the consequence? His granaries would have been pillaged, his house pulled down, and he himself in all probability torn to pieces by the mob. He had too much sense not to know all this, and therefore, in that year alone, he declined to import any corn. The consequence was, that the quantity of corn fell greatly short, and many persons, if they did not there actually die for want, were reduced to the greatest extremity, and forced to leave the country; which could not have happened but for your lordship's ill-judged beneficence. You ought certainly

either to have sent enough to supply the whole people, or not have interfered at all in a business with which you was so little acquainted; for it is not a light thing to risk rash experiments where the lives of many people are at stake.' He was satisfied, when too late, that his charity had been destructive.

May I request it of my readers, then, when they are about to devise plans of beneficence for themselves or others that may tend to derange the operations of those who have been in the custom of attending to the most efficacious means of procuring a supply with a view to *profit* (the only mean that can ever be relied upon as steadily effective for preserving men from want), to advert to this case, and deliberate before they act. True humanity is best displayed by a steady and continued effort to ameliorate the circumstances of the whole body of the people, and not a hasty inconsiderate spurt directed to a particular object, which, by inducing too much profusion at the moment, occasions a waste for the present that only makes the future want be more severely felt. Were this truth sufficiently adverted to, how many of those wild schemes that are bandied about in innumerable hasty and inconsiderate publications would be abandoned, which, under the pretexts of charity and beneficence to the poor, are only propagating error, and sowing the seeds of future misery to those very poor, for whose benefit they are apparently intended! Would to God that I had it in my power to impress the minds of those among such persons whose intentions are upright, with so true a sense of the importance of the subject, as to induce them to act with so much caution at least as never to overlook any fact

or serious discussion that had a tendency to enlighten their minds on that subject ! they would then be able to perceive, that the tender mercies of many men are indeed the severest cruelties.

To tamper with the established mode of supplying provisions to a great body of people is dangerous at all times ; but peculiarly so when there is reason to apprehend, that a real deficiency, were it even to a small amount, does actually exist ; because it has a tendency to deter those whose knowledge in their respective lines of business can alone enable them to know how to act as the emergency of the case requires ; and if such persons be then interrupted in the regular course of their exertions, no one else can supply their place, whatever their inclination may be. Every description of persons who have made it a business to provide any of the necessaries of life for profit, ought then to be encouraged to proceed with the utmost alacrity in what they think for their own benefit, in the assured confidence that they will be under the watchful protection of magistrates and government ; and to feel a conviction that they will be allowed to draw every fair profit that their judgment and industry can entitle them to gain. If James Macdonald in Portree had felt that conviction in the year 1783, the people of Skye could not have experienced the evil that so severely oppressed them. Other islands, by a similar conduct to that which affected him, in well-intending, though ill-informed persons, being too much encouraged, might experience a similar fate. The people in this country are capable of exertions which, there can be no doubt, if they be not unduly checked, will overcome the present distress. Suffer them then, for God's sake, to proceed in their

own way. In the mean while, it becomes the duty of men of sound understanding to give every aid in their power to enable legislators to perceive, and deliberately to investigate, the remote causes that have produced for some years past effects so very distressing to the nation; in order that these, if possible, may be guarded against in future. Nor can there be a doubt, that, if they seriously inquire, with a willing mind, and act with due deliberation in this case, they will be able to discover the cause, and prevent the recurrence of such calamities in future.

Reverting to the motto of this paper, I should deem it fortunate if Tuscany were the only kingdom in Europe in which the disease of governing *too much* prevailed among the rulers of kingdoms. Ever since the reign of Colbert (for so we may denominate that epoch in France) this has been the fashionable disease of all European states; and it has been productive of more individual distress, and has paved the way for greater political revolutions than perhaps any other circumstance that could be named. The immediate effects of that in enhancing the price of the necessaries of life were soon felt, and the direct causes of that particular distress in some measure seen, and partially remedied: yet, the views of men having been directed only to individual points, the general and more remote tendency of that system was not understood, and justly appreciated. Even at this moment surrounding nations, by fixing their attention on striking and prominent objects only, and considering them as *causes* of events rather than as necessary *consequences* of a system of political economy that had been thus radically deranged for a long period of years, suffer strong facts that ought to fix their

attention, to escape their notice wholly unobserved; in consequence of which, some of the most sensible, and I have reason to believe best meaning men in this nation are; at the moment in which I write, busying themselves, not in *futile*, but in *destructive* attempts to effect by legislative restraints and speculative regulations that which it utterly exceeds the power of any legislature ever to effect; and which, if the same train of reasoning and acting (I here allude merely to the subject of provisions) shall be persisted in, must tend most cruelly to derange that system of economy from whose previous derangement has inevitably arisen that calamity, the *beginning* of which only has already produced so much distress among us, and which, if farther augmented, may produce effects that I shudder to think of. Could I look on and see these things with indifference, I must be endowed with a degree of apathy that is contrary to my nature; but seeing them, and feeling as I do, what else can I do than lament that it should be so: and feel the most poignant regret that nothing within the power of this feeble arm is likely to withstand a torrent that seems to be destined to sweep at once with irresistible destruction over a guilty land! Never assuredly could the sentence

Quos Deus vult perdere, prius dementat,

be more justly applied than here. I can only add,

Where this arm fails, may mightier Heav'n defend!

TWO SINGULAR CHARACTERS.

[From Gorani.]

I HAD scarcely entered the boat, going from Lucca by Sinon, which was to carry me to Leghorn, before

I was struck, among several unmeaning figures, with the countenances of two men, the youngest of whom seemed plunged in the deepest melancholy. His companion also attracted my attention, but in a very different manner; which in the end was justified by what I learnt of his adventures.

The inactive life which passengers on board a vessel are obliged to lead, makes them more willing than they might otherwise be to form connexions, in order to occupy their minds, and free them from ennui, that plague to sailors; and which often causes them to give themselves up to excesses of the table. My natural inquisitiveness, increased by the want of something to do, set me upon scrutinizing, if I may so call it, the hearts of my fellow-passengers. This study has its value; it is, in fact, a leaf from the grand book.

The young man, whom I shall call Ariston, scarcely made any reply to the attacks of a monk, whose every feature was strongly marked by incontinence: it was this reserve that first made me esteem him; and my esteem was strongly cemented by a further knowledge of him. We entered into conversation; and I found, with as much pleasure as surprise, and Ariston had received a good education, from which he had greatly profited. I wished to get rid of the monk, who seemed to lay siege to him, for I wanted to know the reason for that melancholy which he could not hide, though he took every means to prevent its being noticed. It was not before our arrival at Leghorn that my curiosity was satisfied. Being then free from the monk, of whom I shall again have occasion to speak, we lodged together, and Ariston gratified my request to know his history.

He was the only child of a very rich merchant of Florence, who had spared no expence in his education; and his parents were only waiting until he had completed his studies to recall him from Bologna, for the purpose of uniting him to the only daughter of an intimate friend. This union, being so well matched, would, no doubt, have been a happy one if the love of the parties had been reciprocal.

The two young people had very seldom seen each other; Ariston however, in doing justice to the face, figure, and understanding of his intended, did not feel in his heart any desire to possess her. It was not so with Felicia. The choice of her parents made her more observing of the qualities of Ariston, and she very soon considered filial obedience as the most pleasing of all duties.

There was only one year wanting to the period upon which the two families had fixed for completing so desirable a marriage. Ariston was finishing his studies at a distance from his intended; and the tranquillity of his heart did not make him feel this absence as painful; till love interfered, overturned the wisest formed project, and fixed despair in the bosoms of the two families.

There lived in Bologna a young female endowed with every charm to captivate a lover. Her parents were in moderate circumstances, but not rich; and lived at a small house in the country, a short distance from Bologna. Ariston saw the young woman, loved her, and succeeded in gaining her affections. The parents, flattered with this passion, as knowing the young man's family, but ignorant that his father had

already engaged his hand, considered this as a fortunate offer. Interviews were not prohibited, and very soon love and imprudence presided at a secret union, the consequences of which were not calculated.

The husband, however, when he had time to think on his situation, was sensible of his fault, and reproached himself for it, without having the courage to own it. Fearing the anger of his father, whom he did not sufficiently know, he added to this fault one still greater. He went into foreign countries, accompanied by his wife, whose parents had exhausted themselves to supply money for a journey, at least imprudent. The new-married couple took the road to Germany, and fixed themselves at Berlin.

At Berlin, as in every other place, one must live. The loving couple felt, that, in spite of their passion, they must gain their subsistence by labour if they would prevent absolute want, and all its attendant consequences, which are frequently accompanied with disgrace. Each of them had profited by their education: the young *sposa*, having been related to one of the profession, was mistress of geography, history, and music. They determined to make use of their talents; and, laying aside a false shame, which commonly only seems as a pretext to cover indolence, they addressed themselves to one of the most celebrated academicians at Berlin, and entreated his protection in the design they had formed of supporting themselves. This man, whose urbanity was equal to his knowledge, procured scholars for them; the husband successfully taught foreign languages, geometry, &c. and the wife also had her scholars.

Two years thus passed in labour, peace, and happiness. The birth of a daughter sealed the union of this couple; but an accident which happened to this child, which the mother nursed, awakened them from their security, and made them feel that there is no perfect happiness when the first of duties has been neglected. The child died of an abscess caused by a blow on its head. The small pox carried off the second fruit of their love; and the wife of Ariston was not able to survive the loss of her children.

Berlin became an odious residence to the wretched Ariston. He quitted Prussia, and passed successively through several towns of Germany, without being able to fix his residence in any one. The remembrance of his losses, and of his disobedience, which so cruelly punished him, followed him every where. Holland offered him but the picture of a military despotism established by the king of Prussia for the interest of the Stadtholder. He went, therefore, to London, and thence to Paris, after having made himself master of the English language by a residence of several months.

Ariston had no longer any expectations of happiness, and was only in search of that repose of which his tortured heart had so much need. Time, travelling, and his reason, though they calmed his despair, did not restore to him his tranquillity. To the remembrance of the loss of an adored wife, and of two children, of whom he was passionately fond, was now added that of a justly-irritated father. The distress in which he had left that father was painted with strong colours in his mind, and rent his heart; he wished to

have flown to his arms, and receive that pardon which he had not even the resolution to request. At last, after many conflicts, he wrote to a brother of his mother: this letter, of which I have seen a copy, was so very affecting, that I do not remember ever to have read any thing that made so strong an impression upon me.

The uncle replied with kindness; informed this unhappy and repentant son of the situation of an indulgent father; invited him to come nearer to Florence, whither he was going himself, in order to prepare the old man, who, having long ago forgotten his anger, was now bewailing the supposed loss of his son; he was anxious to prevent this unexpected return from being fatal to him.

Ariston, in the midst of the joy which this answer from his uncle caused him, was induced by the sensation of his losses to think of nothing but what could recall to his mind his disobedience, and its effects. One task, however difficult it may have been, remained for him to perform; this was, to announce to the parents of his wife, that they had no longer a daughter. They had remained ignorant where this imprudent couple had settled; a change of name, and the most minute precautions, had been employed by Ariston, with the consent of his wife, in order that the two families should never discover their place of retreat. It remained for him to inform them that they had lost every thing, and to fix the poignard in the paternal heart. He at last resolved to do this, but was desirous of waiting until his reconciliation with his own father should be accomplished.

Conformable to the advice of his uncle, Ariston quitted Paris, took the road to Marseilles, embarked for Antibes, and arrived at Genoa. Accident made us companions from that town to Leghorn, where he received a second letter from his uncle. He left me, and flew to Florence; where I have since seen him in the paternal mansion, always melancholy; but having concentrated all the tenderness of his heart on this father who so much loved him, and about to form, through obedience to his father, a new connexion under more favourable auspices.

[*The other Character in our next.*]

DESCRIPTION OF A FOREST LIFE.

[*From an unpublished Drama by C. Lamb.*]

To see the Sun to bed, and see him rise
 (Like some hot amourist with glowing eyes)
 Bursting the lubber bands of sleep that bound him,
 With all his fires and travelling glories round him;
 Sometimes, the moon on soft night-clouds to rest
 (Like beauty nestling in a young man's breast),
 And all the winking stars (her handmaids) keep
 Admiring silence, while those lovers sleep;
 Sometimes, outstrect in very idleness,
 Nought doing, saying little, thinking less,
 To view the leaves (thin dancers upon air)
 Go eddying round; and small birds, how they fare,
 When mother Autumn fills their beaks with corn,
 Filch'd from the careless Amalthea's horn;
 And how the woods berries and worms provide
 (Without their pains) when earth hath nought beside,
 To answer their small wants in the drear winter's tide.
 To view the graceful deer come tripping by,
 Then stop, and gaze, then turn, they know not why,
 Like bashful youngers in society!
 To mark the structure of a plant or tree,
 And all fair things of earth, how fair they be!

THE GENERAL LOVER.

[*From the same.*]

"WHAT is it you love?"

'Simply, all things which LIVE,
From the crook'd worm to man's imperial form,
And God-resembling likeness. The poor fly,
That makes short holyday in the sun-beam,
Then dies by some child's hand. The feeble bird,
With little wings, yet greatly venturous
In th' upper sky. The fish, in th' other element,
Which knows no touch of eloquence.' "What more?"

'Yon tall and elegant stag,
Who paints a dancing shadow of his horns
In the water where he drinks.'

FRAGMENT IN DIALOGUE.

[*From the same.*]

"I knew a youth,
Who died for grief because his love prov'd false,
And married to another.
I saw him on the wedding day,
For he was present in the church that day,
And in his best apparel too,
As one that came to grace the ceremony.
I mark'd him when the ring was given;
His countenance never chang'd;
And when the priest pronounc'd the marriage-blefsing,
He put a silent prayer up for the bride.
He came invited to the marriage feast,
With the bride's friends,
And was the merriest of them all that day;
But those, who knew him best, call'd it feign'd mirth,
And others said,
He wore a smile, like *death*, upon his face.
His presence dash'd all the beholders' mirth,
And he went away in tears."

On a Disease affecting Beans.

‘What follow’d then?’

“O! then,

He did not, as neglected suitors use,
Affect a life of solitude in shades,
But liv’d in free discourse and sweet society
Among his friends, who knew his gentle nature best.
Yet ever, when he smil’d,
There was a mystery legible in his face,
That whoso saw him said, he was a man
Not long for this world!
And true it was, for even then
The silent love was feeding at his heart,
Of which he died.”

TO THE SNOW-DROP.

THOU who to heav’n lifting thy golden brow,
Ey’st unabash’d the glorious orb of day,
I praise thee not: I hate th’ unblushing front!
But ever let me tell your humbler worth,
Ye simple snow-drops! firstlings of the year!
Fairest of flow’rs! sweet harbingers of spring!
How meekly do you hang your silv’ry heads!
Like maidens coyly stealing from the view?
E’en so, upon the ground her modest eye
That fears to meet th’ irreverent gaze of man,
Beauty unconscious bends: and so more pure
Than are your snow-white forms, Sophia strives
To hide those charms, how matchless! from the world.
P. HOMER.

A Query.

THE beans that grew in one particular part of my garden last year were diseased, and they are so again in the very same place this season, though in all other parts of the garden they are now, and were last year, in the most perfect health. The nature of the soil is

not perceptibly different there from other places; nor can I assign any other reason for it, unless that they grow on the place where some asparagus beds had been dug up during the winter 1798-9. I should be glad to receive any information respecting the disease, for I never observed it before. It affects the plants as under.

The leaves as they come through the ground, and afterwards, are more pointed than usual, and never assume that broad luxuriant appearance as healthy plants. As they begin to come into flower, the leaves shrivel together, but still retain their dimensions lengthwise; they then become spotted with black longish spots, that on a slight view might be mistaken for holes. I thought at first that this was occasioned by the black aphid beginning to infest the plant, but afterwards discovered that to be a mistake; for many of those plants never were infested with that insect, while others were affected by it which discovered no symptoms of that sort. The plants grow less freely than others, somewhat after the manner of potatoes that are attacked with the disease of curled tops; but the beans sustain not so much injury from the disease as the potatoes, for they afford a moderate crop, though not so good as those that are in perfect health. Any information respecting the cause or the cure of this disease, or the circumstances in which it most usually occurs, will prove very acceptable.

Index Indicatorius.

THE favour of *Anteaturnicus* is acknowledged.

The Editor returns best thanks to *Leander* for his

obliging letter. The fact he states was previously communicated by another hand, but he is not the less obliged to this correspondent for this favour. It was entirely unknown to him at the time the event to which it alludes took place.

Ruricola is respectfully informed that the Editor is not at all in the line of being acquainted with particulars of the kind about which he inquires, or he should be glad to assist him respecting it. The grievance of which he complains is not confined to one corner; were he to change in that respect, it is by no means certain that he would better himself.

W. Flavel is mistaken in thinking the Editor will decline taking notice of his letter. He is informed that Dr. A. has no connexion whatever with the Board of Agriculture, so that he can neither take praise nor blame for any part of their procedure. His opinion respecting the object of the letter may be in some measure gathered from the contents of this Number.

The favour of *C. Bentley* ought to have been sooner acknowledged; but it was intended to do so at some length; which circumstances before prevented, as they still do. This acknowledgment however cannot be longer delayed.

When a corner can be found for it, the Query of *A. Y.* shall be more particularly acknowledged.

The favours of *Zeno*, *D. D. R. Patrick Prudent*, and *Will Trueman*, are just come to hand.

22.

DECEMBER 1800.

RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 4. VOL. IV.

AGRICULTURE.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, particularly with a view to a proposal for instituting a national experimental farm.

[Continued from page 171.]

ON THE VARIETIES OF THE HORSE KIND.

THE diversities that are known to exist respecting this elegant and useful animal are very great; yet here, as in every other instance, there are few accurate experiments to be found to direct the zealous investigator. Some Arabian horses have been introduced

VOL. IV.

R

242 *Varieties of Horses.—The Suffolk Punch.*

into this country ; but we have little occasion to put them to the trial here respecting that quality for which they are chiefly valued in their native country, that of being able to endure abstinence and fatigue for a long period without succumbing. Swiftmess of foot and strength of wind during the short career of a horse-race, is all that we look for in those light-bodied, nimble horses, to the improving of which our adventurous breeders have attached themselves for several ages ; and in this effort they have been so successful, as to be now, perhaps, without a rival on the globe ; for, in regard to swiftmess for a spurt, I am inclined to believe that the English-bred horses exceed all others.

We are possessed of yet another breed of horses, that for one peculiarity may perhaps be unrivalled : I mean the large black dray-horses, which, in point of size and fatness, do not, that I know of, admit of any equal ; though in point of hardiness, vivacity, and nervous energy, they rank perhaps among the lowest of their species. Eastern princes have their stables filled with stately elephants for parade, because none else can afford to keep them ; and wealthy London brewers, for the same reason, turn out these monstrous animals day after day to paw up the streets, and to be gazed at as a wonder by the admiring multitude, who are thus taught to know that wealth can procure abundance even in the midst of scarcity.

Of the truly serviceable draught horses, perhaps, that breed known by the name of the Suffolk-punch deserves to hold the first place among the horses bred in England. This is a strong, firm, well-knit horse, that is capable of considerable bodily exertion and long

Varieties of Horses.—The Suffolk Punch. 243

perseverance, though its motions are slow, and its figure tending to the clumsy sort. He requires substantial food; but, if properly used, will make an ample return by his services for his keep.

There is a still more valuable breed of draught horses reared in North Britain, and known there by the name of the Lanark horse. He is lighter in the body than the Suffolk-punch, and more elegantly formed in all respects. His limbs are clean and sinewy, his neck longer, his head of a finer form, and his eye more sprightly and animated than either of the former breeds. His tread is firm, though tending towards the nimble side, and he is capable of exerting a wonderful degree of muscular strength for a short push, without being hurt by it, which makes him peculiarly valuable for that hilly country, where there is a necessity of calling forth such exertions on innumerable occasions. He is hardy, can live upon any food, and is perhaps the thriftiest horse for cart or plough that is to be found in this island—possibly on the globe itself. For these purposes he is peculiarly adapted by the evenness of his temper and the steadiness of his movements. For the plough, perhaps, he is every thing that could be wished, being in point of size neither so large nor unwieldy as to render him a burden to the soil; two of these horses in the stiffest soil, under good management, being perfectly able to draw a full furrow with ease; and for horse-hoeing, or ploughing a light soil in good order, one, of the lightest sort, performs the work with alacrity and ease. What a benefit would result to this nation were a set of judicious experiments to be conducted for a sufficient length of time, for the

purpose of ascertaining the comparative powers and expence of keep of these three different breed of horses, so as that any one who chose it might know with certainty the profit or the loss that would result to him from employing the one or the other for any particular purpose that he had in view !

With the draught horses of foreign countries I am not much acquainted ; but there can be little doubt that among these there may be some found which possess certain valuable qualities that are not met with in any of ours, by means of which the crossing for particular purposes might perhaps be beneficial.. The Neapolitan horses are represented as large and showy, but nerveless and unenergetic. The Holstein horses have qualities approaching to these. The native Swedish horses have been represented to me as quite the reverse of these. They are small, scarcely ever exceeding fourteen hands high, have a spirited and lively eye, and animated nostril ; their body is firm, legs nervous, but nothing strikingly elegant in the form of either ; they are, however, indefatigable in travelling, and approach nearer to the Arabian horses in point of abstemiousness and ability to endure fatigue than any other. They are too light for draught, and too little showy for the saddle in parade ; but for carrying a person with ease and expedition over rough and mountainous roads with poor accommodation, they have perhaps few equals among their species.

The Iceland horses seem to be of nearly a similar breed, though they are rather smaller in size and more elegant in form, and they possess qualities of the same sort. There was once also a breed of small elegant,

horses similar to these in Scotland, which were known by the name of Gallaways, the best of which sometimes reached the height of fourteen hands and a half. One of this description the writer of the present article possessed, it having been bought for his use when a boy. In point of elegance of shape, it was a perfect picture; and in disposition was gentle and compliant. It moved almost with a wish, and never tired. He rode this little creature for five and twenty years, and twice in that time he rode one hundred and fifty miles at a stretch without stopping, except to bait, and that for not above an hour at a time; and it came in the last stage as well as himself, with equal cheerfulness and alacrity as it travelled the first. He could have undertaken to perform on that beast, when it was in its prime, sixty miles a day for a twelve-month running, without any extraordinary exertion. He states these facts merely to show what is attainable by bestowing a proper degree of attention to the breed of this species of animal; for feats approaching to this are not common even among that kind. This breed is now nearly extinct in Scotland, which is much to be regretted; for could a sufficient number of these horses be obtained to make a proper selection from among them for breeding from, it is difficult to say to what degree of excellence they might in time be raised. By a judicious cross also, their size might be improved without much abating their other qualities. A cross between these and the Lanark breed would have been admirable for many uses, particularly for the plough in a district occupied by good farmers. In the island of Mull, on the west coast of Scotland, some

remains of this breed are still to be found, though they are so much neglected as to be fast degenerating by intermixture with other breeds.

There is yet another breed of horses still to be found in the Shetland isles, which, though of a very diminutive size, are in other respects superlatively excellent. Were I required to sketch out a model for a horse that were to possess in the highest degree strength of body and lightness of movement united, I should take the picture of one of these. I have seen some of this breed that scarcely exceeded three feet in height, but would have carried a man of twelve stone weight a journey of forty miles in one day with ease: I need say nothing more of their strength and activity. In form, they are superlatively elegant; their body is much thicker and more compact than that of a blood horse; the muscles of the thigh and shoulder diminish gradually as they descend, till near the pastern they are as small and sinewy as that of the blood horse; their pasterns, however, are nothing near so lax, but firm and sinewy; the hoof hard and tough. The neck, towards the shoulder, is also firm, but towards the head it is small, and the head itself clean and light, with an eye that indicates health, strength, and animation. Could a horse of this kind be found of the size of one of the London drays, it would be an animal of inestimable value; yet this creature, because its size is small, is neglected, and will probably be suffered to become extinct; as if it were not in the power of man, by judicious management, to raise this breed gradually to a larger size, and thus obtain an excellence among this species of creatures that has been hitherto deemed unattainable, merely be-

cause we have only chosen to pamper with pleasure, large, lubberly brutes, that are fit for no purpose but parade and waste alone.

OBSERVATIONS ON A NEW MODE OF REARING
POTATOES.

To Dr. Anderson.

“ DEAR DOCTOR,

Manchester, Nov. 7, 1800.

“ DURING the last spring, when potatoes were at the immoderate price of 20s. and upwards per load of 240lbs, I was determined to try the experiment of planting some of the shoots or sprits, and compare the produce with what were gained on the same land, and from the same kind of potatoe planted in the usual manner by cuttings of the root itself, which has always appeared to me as a very extravagant system, and a great waste of provisions; it has, however, hitherto been deemed necessary, and that a crop could not be procured by any other means; a belief in which doctrine deterred me for many years from making the experiment myself. I selected in April last shoots of about two inches long (of which very great numbers may always be procured when the potatoes are taken out of the holes where they have been guarded during the winter), and planted them in drills, so as that they should be covered fully an inch with soil; in due time they appeared above ground without (I believe) a single failure, and with a very promising healthy colour, which continued during the whole period of their growth; and my only fear was

that they were too vigorous, and the haulm too heavy. I had them taken up a few days ago, and am happy to inform you that the produce is extremely good, and *fully equal* both in quantity and size to any crop in the county; so that I am completely satisfied with the result of the experiment. If you deem this information of any importance at this very interesting period, when every saving in the consumption of provisions is a duty we all owe to the community, you will use your own discretion in communicating it to the public."

The respect that I bear to this correspondent, and the impartiality which it is my constant endeavour to maintain, induce me to give the above experiment to the public fairly as it has been stated to me; but the duty I owe to my readers and the public, at the same time compels me to add, that the result is so far contrary to my own experience, that I suspect there must be, on the one side or the other, some latent grounds of fallacy which remain to be discovered. To enable such of my readers as have opportunity for entering peculiarly into this very interesting investigation to judge in this case, I shall state a few facts that have resulted from experiments made with accuracy; and then suggest some hints tending to bring under view a few circumstances which seem not as yet to have been sufficiently attended to. I shall only premise, that I have frequently reared potatoes by the mode here stated; but the result was always so unfavourable, as never to excite an inclination to make an *accurate* experiment on that mode of planting: nor do I know

that it ever yet has been done by any one, though it has been mentioned vaguely by hundreds.

[N. B. The experiments quoted below were, together with several others, communicated to the Bath Agricultural Society, and were published in the fourth volume of their correspondence.]

“ In the month of April, 1777, a piece of ground was prepared for the experiment. This had been in grass some years, and now got a slight kind of trenching, barely to cover the sward, without any dung. It was found that this small piece of ground could contain exactly twenty plants in length, at sixteen inches from each other; and it was divided into rows, crossing these at right angles, at the distance of sixteen inches from each other also; so that the plants stood in squares sixteen inches from one another in every direction. The soil of this patch was thin and poor, insomuch, that when in grass, the crop was so scanty as scarcely to admit of being cut with the scythe; but no dung was put upon it, on account of the difficulty of spreading it so equally as not to affect the accuracy of the experiment.

“ On the 5th of May twenty plants of each of the following kinds were provided and planted, each kind by itself, in a single row; all the plants in each row being, as nearly as possible, of one size. A row of potatoes cut promiscuously having been first planted next the edge of the plot, for the sake of accuracy,

1st row. Small potatoes whole. The twenty plants together weighed	} ounces. 5½
2nd. Small potatoes cut in two	3½

ounces.

- 3d. Small pieces cut from the small end of }
 large potatoes, with one eye in each . . . } 1½
- 4th. Pieces of an equal size with the former, }
 cut out of the large end of large pota- }
 toes, with one eye in each } 1

[N.B. Though it was not expected that any difference could arise from the difference of circumstances here noted, yet, as this had never been ascertained by experiment, the fact was not certainly established. This trial was meant to give it the certainty wanted.]

- 5th. Large pieces cut from the great end of }
 the same potatoes that were employed in } 26½
 No. 3 and 4, having only one eye in each }
- 6th. Large potatoes, from which all the eyes }
 had been cut out, save one about the } 121½
 middle part of the bulb }
- 7th. Large potatoes with one eye only, left }
 in the small end of the bulb } 123½
- 8th. Large potatoes planted whole, as nearly }
 as could be got of an equal size with } 124½
 the former }

[N. B. No. 6 and 7 were intended to discover whether the produce continued to increase with the weight of the seed planted. The leaving only one eye was intended to make these plants resemble, as nearly as possible, those in No. 5. The variation between No. 6 and 7 was with the same view as that in No. 3 and 4. No. 8 was intended to discover if plants are damaged in any respect for seed merely by being wounded,

and what was the result of planting seeds with many or few eyes.]

“ On the same patch of ground that was prepared for the foregoing experiment, and immediately contiguous to the 8th row in the preceding experiment (one row only intervening, which will be afterwards taken notice of), was planted on the same day with them seven other rows of seeds, being each of them exactly of the same size and weight with the foregoing; so that it was an exact repetition of the same experiment, intended to save time. The only difference between them was, that the seventh row was here entirely omitted for want of room. The general result of these two experiments was as under; the uppermost row of figures, where double, denoting the result of experiment 2nd, and the undermost of experiment 3d.

No. of rows.	No. of seeds that germinated.	Weight of seed. lb. oz.	of roots raised. Average	Weight of the produce of each row. lb. oz.	average weight of the produce. lb. oz.
1st,	{ 19 20 }	11	{ 123½	{ 6 0 8 12 }	7 6
2nd,	{ 19 16 }	3½	{ 119	{ 5 13 6 0 }	5 15½
3d,	{ 17 15 }	1½	{ 58	{ 2 8 1 15 }	2 3½
4th,	{ 17 17 }	1½	{ 71	{ 2 3½ 3 0 }	2 9½
5th,	{ 20 19 }	26	{ 191		12 2½
6th,	{ 20 19 }	7 10½	{ 286½	{ 19 3 16 15½ }	18 1½
7th,	{ 20 20 }	7 11½	{ 374	18 10½	18 10½
8th,	{ 20 26 }	7 12½	{ 400	{ 21 5½ 20 3½ }	20 11½

“ From these two experiments thus carefully collated it appears, that there is such a near coincidence between the produce of the corresponding rows in each

experiment, as gives us reason to believe, that the average obtained from each row is nearly what would result in general practice from planting seeds, corresponding to those planted in each of these rows respectively; so that the corollaries deducible from thence may be admitted as general rules in practice.

“ It may, in the first place, be inferred, by a careful review of these two experiments, *that the produce is not materially affected by planting for seed, either whole potatoes or cuttings, or large or small potatoes merely as such; for that it is only incidentally that either of these particulars can affect the crop.* The whole potatoes in the first row yielded a smaller produce than the *cuttings* in the 6th row. Seed from *small* potatoes yielded a smaller produce than was obtained from *large* ones in the 5th, 6th, 7th, and 8th rows; but it yielded a greater produce than was obtained from *the same large* potatoes in the 3d and 4th rows.

“ It seems, in the *second* place, to be a fact confirmed by every step in both these experiments, *that the weight of the crop is always in some measure influenced by the WEIGHT of the seeds planted.* The 3rd and 4th rows, in which the seeds were *lightest*, yielded the poorest crop; and a progression from lighter to more weighty is observable in the *produce*, as well as the seeds through the 2nd, 1st, 5th, 6th, 7th, and 8th rows. Some trivial variations do not disturb the general rule, which seems to be sufficiently established by the general result of the first six rows.

“ But although it appears from these experiments sufficiently obvious, that the crop of potatoes is augmented

by the weight of seed, yet it also appears from them, that the weight of produce is not augmented *in the same proportion* with the weight of the seed: for, although the weightiest seeds have always yielded the weightiest crop *in proportion to the extent of ground*, yet the lightest seeds have as invariably produced the greatest return *in proportion to the weight of seed planted*. That the reader may be enabled to observe every particular relating to these two proportions, the following table has been constructed. In that table is expressed the quantity of seed, and the produce of an English statute acre, proportioned to the weight of seed and produce in the different rows of the preceding experiments, together with the returns from the seed in each row, and the clear produce after deducting the seed.

“ That those who choose it may be able to follow these calculations, they need only to be informed, that an acre would contain 24,502 plants at sixteen inches from each other: all the other data necessary are expressed above.

Rows corresponding to those of the same numbers in Exp. 2nd and 3d.	Quantity of seed required to plant an acre, in the proportion of each, now reduced to bushels and decimals. <i>Bush. Dec.</i>	Quantity of produce from an acre, in the proportion of each row, reduced to bushels & decimals. <i>Bush. Dec.</i>	Proportional returns of seed from each row.	Clear produce from an acre, in the proportion of each row, after deducting the seed. <i>Bush. Dec.</i>
1st,	7.50	161.30	21.4	153.80
2nd,	5.13	130.5	25.3	125.37
3d,	} 2.05	52.6	25.7	50.65
4th,				
5th,	35.5	266.5	7.5	231.00
6th,	167.4	396.1	2.4	228.7
7th,	168.6	400	2.3	231.4
8th,	170.2	453.9	2.6	283.7

254 *Observations on Rearing Potatoes.*

“ From this table it appears, that the 3d and 4th rows, in which the smallest quantity of seed was planted, yielded the greatest returns, *in proportion to the seed*, but the smallest, *in proportion to the extent of ground*. The returns of seed being as 25.7 to one; whereas that of No. 8th was only 2.6 to one. But the total average produce of the 3d and 4th rows was only 52.6 bushels; whereas that of the 8th row was 453.9 bushels.*

“ To obtain a just notion, however, of the profit that would be derived from cultivating a field in the one or the other of these ways, it is necessary to deduct the seed in both cases from the gross produce, the remainder only denoting the free produce. The last column in the table above marks this free produce in all the different cases above stated. And from this table it appears, that the total free produce from the smallest seed here employed was only 50.65 bushels per acre; and that where the largest seed was employed, amounted to 283.7, so that one acre in the last case yielded nearly as much free produce as six acres in the first.

“ Hence it seems reasonable to infer, that it is in no case profitable to plant small potatoes, or small cuttings, unless where it is meant to increase as fast as possible a favourite kind; in which case it may be sometimes eligible to plant pieces very small, as in that way the kind will be most quickly multiplied.”†

* By experiments more at large since that time, and on a richer dunged soil, I have obtained a return from seeds even larger than those in No. 8th, in the proportion of at least ~~ten~~ to one, so that the very small returns in this experiment must be ascribed to the great poverty of the soil.

† Since the above was written, I had reason to believe, that the re-

When these experiments were made, I had had but a very slight glimpse of the great diversity that takes place in regard to the remarkable peculiarities which tend to discriminate one kind of potatoes from those of another sort; and I was, like most persons that I meet with, too much disposed to draw general conclusions from particular facts; but a more discriminative attention to the phenomena of nature has taught me, since that time, a much greater degree of circumspection. I believed, that what I had found to hold good with regard to the particular kind of potatoe I made use of in that experiment would probably hold good with regard to all other sorts; yet even at that time, and though that was then my decided conviction, I was so much aware that it *possibly* might be otherwise, that I took particular care to describe, with as great precision as I could, the potatoe which I used: and I now find, that this caution was more necessary than I was then aware of. I fear that most of those who write, or form judgments on this subject from the particular facts that catch their notice, are not even yet advanced to the state of caution that I then felt.

Some years after these experiments were made, having been often assured that potatoes raised in the *lazy-bed* way set out many potatoes from that part of their

turns from *large* potatoes may be augmented greatly beyond what it was in this experiment; whether it could by any peculiarity of culture be brought to equal that from small, my experiments, which have been interrupted by other avocations, do not enable me to say—but it is not at all improbable.

stems which had been covered by the mould, I was induced to try the experiment—but *not one* potatoe did I find produced in this way; and hence I felt in my own mind a persuasion that nothing of that sort ever did occur. A little more attention, however, to this particular since that time has enabled me to discover, that there are several kinds of potatoes which actually possess that quality, though by far the greater part of those sorts commonly cultivated by us do not possess it in the smallest degree. This opened my eyes. The endless diversity that I discovered in the peculiarities of potatoes that I reared from *seeds*, served completely to remove the film that had till then prevented me from seeing clearly; and I am now satisfied, as I think every person who inquires with a *willing mind* will be, by attending carefully to experiments of that sort, that all inferences from facts observable in one sort of potatoe, will prove very doubtful if they be applied to another sort. To this error I am quite convinced we must attribute the very contradictory results of the same experiments when made by different persons, and many other phenomena that now produce only doubt and confusion in the ideas of men respecting this very valuable esculent. I therefore warmly recommend to all who shall be inclined to investigate this subject a special attention to this circumstance. The potatoe is at present a boon to this country; but when (if ever) it shall be duly attended to under this point of view, its value will be augmented in a ratio that no one can at present pretend to estimate. I have at this moment in my possession two kinds of potatoes, which were both given to me as excellent sorts; one

of which, upon the same soil, and under the same culture, yields a produce (to speak in the most moderate terms) of at least TEN times the amount of what can be obtained from the other. Is it then a wonder, if one man, in stating a *maximum* crop, should mention a produce so much beyond what another could ever obtain, that he believes it entirely fabulous? I do not expect that I shall be believed by most persons who have been in the practice of rearing potatoes, when I say, that I have lifted at one crop, at the rate of *thirty tons* per acre. Yet the fact is not the less true for these doubts. I myself do not believe that any man could rear above two tons from an acre, if so much, of *one* of the sorts that I have just mentioned; yet this sort has been cultivated, I have reason to believe, in one district for many years.

It is not a little remarkable also, that this potatoe, so insignificant in regard to the quantity of produce, is at the same time of a *quality* that ranks among the lowest of any that I have ever tasted, and greatly inferior to the more productive sort; though neither is so good as many others that I have seen. From this fact, corroborated by many other congenial observations, I am perfectly satisfied, that the common opinion, which supposes that those kinds of potatoes which yield the largest crops are necessarily of a *bad* quality, is entirely erroneous. It is merely accidental. They may be good, and at the same time extremely productive, or very much the reverse; so that I have not a doubt, but a time may come, if ever the attention of men should be steadily directed towards that point, when crops shall be more productive than any we have

yet seen, and at the same time of a superior taste and flavour to any that have yet been noticed.

It was from this consideration, that I recommended to the Board of Agriculture, a few years ago, to deliberate upon the propriety of offering a premium of ONE THOUSAND POUNDS, for producing a kind of potatoe which, upon accurate trial, should be found capable of producing at the rate of thirty tons per acre at least, and of a fine quality, and fully ready for being taken out of the ground in the month of August. The discovery of such a potatoe would be of inestimable value to this country; and would have tended to lower the price of provisions *an hundred* times more than the *two millions* and upwards that were laid out by government for the importation of corn in the year 1796, or the six millions or upwards that will probably be thus expended this year. I do not expect that these hints will be considered, in the present day, as any thing else than chimerical reveries; but I am well pleased to consign them to posterity. *Diri.*

With regard to the experiment of my worthy friend, that gave occasion to these remarks; though it was not made with all the accuracy that could be wished, yet it ought not to be disregarded, as it may lead to some useful investigations. From my own experiments, above stated, there can be no doubt that in many, I think I might venture to say in *most* cases, the shoots that set out from a large lump of potatoe, whether whole or cut, are in general much more vigorous than those from the smaller sort (and perhaps from some eyes in the same bulb than from others). Every one who has observed the way in which these

shoots grow, must know, that they have advanced but a very short time before they begin to set out roots all round the parent bulb, which strike directly into the soil. At the first, their whole sustenance is derived from the potatoe; by and by they begin to draw a little nourishment from the soil; the proportion of nourishment they derive from the soil is increasing every day, while that which they get from the parent bulb is diminishing, till at length the last dies entirely, and they derive nothing but from the soil. This is exactly analogous to the nourishment of a lamb: it lives at first on its mother's milk entirely; it then eats a little grass along with the milk; and ere long the milk is dried up, and it lives wholly on grass. May it not happen, then, that a very vigorous sprout, which has been produced from a large potatoe (and these are probably those which advance first), by being separated from the potatoe after it has been properly nursed, will (like a well-nursed lamb), if planted in a soil where it finds abundance of nourishment, continue to advance without suffering a great check, and keep the superiority that it has once obtained? From this circumstance it may happen, that in one particular case a very tolerable crop may be thus produced from sprouts; and I have scarcely a doubt but the experiment may be so managed, as that the crop from sprouts might be better than that from actual bulbs; though the real fact might be, that, taking things fairly upon accurate trials, the result, in general, would be the reverse. We cannot be too cautious about drawing general conclusions from particular facts, until they are fairly collated with others. I shall take an

opportunity soon to point out some other peculiarities respecting the propagation of this valuable esculent, that may perhaps be applied on some occasions to useful purposes.

NATURAL-HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

On Viviparous Flies.

[Continued from page 197.]

NOT only are the diversities very great that are observable between the *varieties* of the same species of the larger animals on this globe, and of vegetables ; but there is reason to believe, that a similar variation occurs in many cases with regard to insects also. As yet, however, we can speak with very little certainty respecting the varieties of any one species of insects, because these have hitherto scarcely attracted notice : but there can be no doubt, that when this subject comes to be properly inquired into, it will be found to open a source of considerable improvement in various respects. Dr. Anderson, of Madras, only a few years ago, introduced into Bengal a variety of the silk-worm, which undergoes all its changes in the space of one month, and therefore is susceptible of a kind of management that cannot apply to the silk-worm reared in Europe.

All the insects that we have hitherto had occasion specifically to notice in our Recreations, proceed from eggs deposited by the parent; and it was for a long time as generally believed, that insects were produced from eggs only, as that quadrupeds were universally brought forth in a living form: but this rule is now found to admit of exceptions, and of exceptions among insects that so nearly resemble each other in their form, habits, and all their future transformations, as would entitle them to the name of *varieties* only of the same kind, were it not for this very striking diversity; a diversity, however, that is by no means obvious, and which, therefore, very long eluded the notice of the acutest observers of nature.

There are few persons who do not know that the large blue fly, the *Musca vomitoria*,* is constantly on the watch during the summer months to deposit its eggs on the meat in our shambles and elsewhere, and that from these eggs proceed worms that tend much to deteriorate this kind of our food; but it is not so generally known, that there is another fly, the *Musca carnaria*,† which so nearly resembles the former, as not to be easily distinguishable from it by an inexperienced eye, which lays no eggs, but deposits its young *in a living state* upon the same meat, and which appears under the same worm-like form, feeds as it does,

* *Musca vomitoria*, antennis plumatis pilosa thorace nigro, abdomine cœruleo nitente. Linn. Syst. Nat. p. 989, n. 67.

† *Musca carnaria*, antennis plumatis pilosa nigra, thorace lineis pallidioribus, abdomine nitidulo tessellato, oculis rubris. Linn. Syst. Nat. p. 990, n. 68.

increases in size, undergoes all the transformations so much in the same manner as the former, and finally appears in the fly state so little different from the other, that they are only to be discriminated by the keen eye of a well-informed naturalist: in short, these two kinds of insects differ much less perceptibly from each other, than a short-haired sheep does from a full wool-bearing sheep of any sort, or a shock dog from a greyhound.

Redi (who above two hundred years ago, by a train of accurate observations and judicious deductions from them, did more than any other man ever did to eradicate those popular notions respecting spontaneous generation, and similar doctrines which ingenuity and indolence had devised as an apology for ignorance) had so far got a glimpse of this deviation from what he conceived to be a general law of nature, as to suggest it as an object that required farther elucidation; but it was reserved for Reaumur fully to develop this mystery; and it is now established beyond a doubt, that not only these flies, but many others, are viviparous in the strictest sense of the word. We have already had occasion in this work (Vol. II. page 96) to remark the still more general exception to the usual course of nature in regard to the propagation of the aphides, which are at one season of the year oviparous, and at another viviparous, with several other singular diversities respecting the propagation of animals.

Many are the circumstances that concur to mislead the young observer respecting the propagation of viviparous insects. We have in a former volume observed (Vol. III.

p. 263), that the numerous and greatly diversified class of flies called *ichneumon*, are directed by an unerring instinct to deposit their eggs for the most part in the body of some insect or its larva, where they are hatched, where they feed upon the very substance of the animal itself, and from which they sometimes issue in their worm state after having attained their full size; nay, sometimes they undergo their final change in the body itself of the insect on which they have been fed, and come forth in their perfect *imago*, or fly state. Until this economy of nature was completely understood, it occasioned infinite perplexity in the minds of men on this subject; and metamorphoses little less wonderful than those of Ovid were seemingly realised. An animal was never, indeed, transformed into a tree; but a living worm was often supposed to be the parent of a living fly which was capable of performing all its functions in perfection the instant after it was born; while at other times the same worm was seen to produce other worms that became insects of a very different form, after having undergone another change. These perplexities are now clearly removed, and we are enabled to trace the progress of nature with a superior degree of intelligence.

The circumstance just stated, however, tended, no doubt, to prevent for a long time the discovery of the viviparous nature of many insects; for when any one chanced to observe such flies deposit a living worm, it was not unnatural to suppose that this might be one of those parasitic insects which had been deposited in its body by another insect, and which was now making

its escape to prepare for its final change ; so that they would be suffered to pass without particular notice, as nothing extraordinary. It is easy, however, for any one who has a doubt as to this particular to satisfy himself respecting it ; for, as every insect, if left at freedom, places its young only in situations where its natural food is at hand, all that is necessary in this case is, to leave the creatures thus produced to their own free choice. If they begin to feed, it is a clear proof that they are the young of the creature from which they have proceeded, and not a parasitic offspring ; for these last never leave their abode till they have no farther occasion for food, and are now only in quest of a proper place in which their transformation may be effected.

That the reader may be able to distinguish this viviparous fly from the large blue house-fly, which it so much resembles, he must remark, that though it has the same port, and disposition of wings, and is nearly of the same size, yet the proportion of its body is somewhat more slender, and a little more bent towards the end than that of the blue fly ; it is, besides, of a greyish tint ; and, upon examining it closely, you will perceive, that this greyish colour is occasioned by some irregular longish stripes on the corselet running lengthwise, and still more irregular marks of the same kind on the body, all of them of an ashy grey, separated by a shining brown, which, under certain points of view, appear of a bluish tint. Its legs are black, the small scales which cover its halteres or balancers are whitish, and its reticular eyes reddish.

Though the external figures of these two flies are so much alike, Mr. Reaumur found, when he proceeded to dissection, that their internal formation was extremely dissimilar. The eggs in the blue fly, as in most of the oviparous insects, are divided into two clusters, which occupy the principal cavity of the body; those of the viviparous kind presented to the eye the appearance of one spiral mass going from the centre to the circumference in continued folds over each other, similar to the spring of a watch. Upon a particular examination he found, that this spiral coil, when he attempted to unwind it, came off in the form of a broadish flat band, like a kind of riband, but of some degree of thickness. This riband, when so unwinded, was of an appearance somewhat like carving, or rather Marseilled work. On a nearer examination still, he found that these inequalities were occasioned by the young which were placed all along it in parallel rows, one beside another, edgeways; and the thickness was the diameter of the body of one of them. These were of a brownish colour towards the extremity, and the young fry quite alive and active. Towards the centre of the coil the colour was whiter, and the young not yet so far advanced in maturity; so that these must be extruded in succession as they attain maturity. In point of prolificacy, this fly far exceeds most others; for, by the nearest estimate he could make, there were contained in this single case at least twenty thousand worms. The eggs of the blue fly are far less numerous.

In yet another particular does the procreation of this

insect exhibit some unusual phenomena. Among viviparous animals in general, the young are extruded from the body and the *uterus* at the same time; but this is not the case with the insect now under consideration. Mr. Reaumur observed, that the young were extruded from the riband-like membrane (which corresponds with the uterus in other animals) for some time before they were allowed to see the light. They remained in the cavity of the abdomen during that period, and might thus be said to undergo a second birth. This is certainly unusual among large animals; but it is not without examples that are somewhat analogous to it, and equally unlike the usual course of nature both among oviparous and viviparous creatures. The *coccus* extrudes its eggs from the uterus, though they are still retained under the abdomen, in such a manner as to form, as it were, a part of the animal itself for a considerable time, until they are vivified and make their escape; and though the cub of the opossum be actually extruded from the body of the mother while it is yet in such an imperfect state as more nearly to resemble a foetus produced at a premature birth than a perfect animal, yet it is immediately taken by the mother and placed within the pouch under her belly provided for that purpose, where it fixes itself without motion for a considerable time until its faculties become developed; and it is only then, when it has acquired powers similar to those of the young of most other quadrupeds at their birth, that it separates from the mother: so that this second birth more nearly resembles that of other animals than the first.

Something analogous to this last is also observable respecting birds: a few of these are fully covered and capable of running about and picking up their food the moment they break the shell; but many others, indeed the greater part of birds, are at first almost entirely naked, and are incapable of making any other effort for obtaining food for a considerable time, than barely to open their mouths to permit the parent to drop the food into them. These diversities have, no doubt, been established for wise purposes, though we are incapable of comprehending them.

I have already remarked, that though the larva of these two kinds of flies, when those of the blue fly are extruded from the egg, not only live upon the same food, but also undergo all their succeeding metamorphoses in the same manner; these changes are effected in a manner somewhat different from any of those that have been hitherto noticed in this work.

When the worms have attained their full size (which is in general in seven or eight days) they quit their food, and go in quest of some loose earth, in which they bury themselves. They soon lay themselves to rest, and experience, as usual, a very great change: the body, from being of a longish worm-like shape, contracts in length, and expands greatly in thickness, assuming by degrees an oblong form, bearing a striking resemblance to that of an egg. The skin of this egg-like mass is at first white and soft; but gradually becomes firmer, harder, and darker, till it at length assumes a brown tending to red, and a hardish consistence approaching to that of dry-leather.

While it is yet in its whitish state, if it be opened, no appearance of organization can be discovered : it seems to be a mass of semi-fluid matter of a gelatinous kind. By degrees some faint traces of organization can be perceived ; these become stronger from day to day, till, after the lapse of about twenty days, the nymph has assumed its complete form ; and, the parts being consolidated, it bursts its prison, and issues forth a perfect fly. Mr. Reaumur was at the pains to open one of these eggs (if you please so to call them) day by day, from the 27th of April till the 16th of May, and has exhibited the appearances that he discovered in a great many figures, Vol. IV. Plate 21, to which the reader who is desirous of tracing all these changes through their nicest minutiae, is referred. The figures that we gave in our last number, are sufficient to convey an idea of the general nature of these changes ; nor is it within the limits of our plan to do more than this.

There are several other viviparous flies already known, and probably more still that have not as yet been discovered ; but enough of these are known to teach us caution about forming general conclusions from particular facts in this case more than in others. The beautiful arrangement of the young in the womb of the mother above described, is by no means universal among the flies of this sort. They are in some cases arranged in a single group, lying parallel to the direction of the body ; and probably they assume a variety of forms, and differ from each other in many other particulars.

Some viviparous flies have been discovered that are of

a very minute size; and there is reason to think, that there may be myriads of the same kind floating in the air (like the seeds of mould) so infinitely small, as not only to elude our eye-sight, but even so very minute as to elude the power of our best microscopes; these too, like the rapid vegetation of mould, may admit of such a quick vivification as readily to account for the production of those *animalculæ infusoriæ*, which have so much attracted the notice of modern philosophers, and so much puzzled those who think that they are able to account for every phenomenon of nature. But upon this subject I must not farther enlarge at present.

ON THE TENACITY OF LIFE OF SOME INSECTS.

To the Editor of Recreations, &c.

SIR,

I HAVE perused with very great pleasure your Recreations in Agriculture, Natural-history, &c. &c. as far as Number X. and promise myself much entertainment in your future numbers. I am but little used to writing on these subjects, but beg leave to offer a remark or two.

Having thus far intruded upon your time, I beg leave to make a few observations respecting some other insects.

Looking from a window a few summers ago, I saw a bird (the wagtail) make a spring at a white garden butterfly that came over it while it stood on the ground; it brought it down, and there left it as if in wanton play: the fly, however, had received a severe

270 *On the Tenacity of Life of some Insects*

bruise, and lay struggling on the ground. I went some time after and took it up, and, by way of putting a period to its pain, cut off its head with a pair of scissars; I then tossed it up, expecting it would fall as a dead fly, but, to my great astonishment, it made use of its wings, and with the assistance of a slight breeze, flew to a considerable distance. I repeated the experiment several times, and it kept itself up in the act of flying for perhaps forty or fifty yards with the passing breeze; a stranger to its situation might have conceived it to be in a perfect state: having satisfied myself so far, I put my foot on it.

In the month of August last I had four pots of mignonet, which stood in the window, destroyed in a few days by the caterpillar from the white garden butterfly; I thought I would make an experiment on the first butterfly that I caught in the house. On the 19th of the same month I took one among the pots; I immediately cut off its head with a pair of scissars; I threw it up to see if it would fly, and it seemed only to want sight, for it flew with as much strength as before, and was some time before it came to the floor; three hours after I threw it up again, and it seemed to have the same power of flying; six hours after I made the same trial, and with the same effect; the next morning it seemed to retain all its faculties but that of sight. I showed it to several of my friends through a glass (to convince them that its head was really off), who were equally astonished with myself. The second day, August 20th, it could fly as well as the day before. On the 21st, or just fifty hours after losing its head, I tossed it up in the room to show

a gentleman, and it flew apparently with as much strength as the first time: it seemed to have the full use of its legs, wings, and body, in running and flying; when I threw it up it would take a kind of circular flight and descend gently, and when it came to the ground would flap its wings just in the way I have seen them when at liberty on a flower; it would then set them erect, and when once fixed, would remain in the same position till it was again disturbed: but I must observe, that it did not seem satisfied on a smooth surface, nor would it rest till I put it on something by which it could hold with its claws, such as paper or cloth. On the 22d it became more feeble, and when tossed up made very little effort to fly, but appeared to have the use of its legs, and could flap its wings; and when I laid it on its side would immediately raise itself on its legs with its wings upright. The 23d it could not attempt to fly at all, but when touched would move both its wings and legs; about noon it appeared nearly as if dead, and lay on its side, not being able to stand, but still showed signs of life. A few minutes after three I found it quite dead, with its wings bent the wrong way, or under its belly: thus lived this little insect four days and a half without a head.

I hope you will not think me tiresome if I state another fact or two. Some years ago I was bitten by a bug in the night; I struck a light and caught the insect: I put it in the vessel under the bed; the next morning I took it out, in order to show a person who had never seen one, and put it in a bit of paper; it had been four hours under water: when I opened the paper again I

272 *On the Tenacity of Life of some Insects.*

was surprised to find it alive. I determined to see how long it would live in this confinement without any apparent food; I examined the paper frequently, and it was not till the end of *three months* and a few days that I found it *dead*. I caught it in August, and it was alive in November.

I could wish that all who are troubled with these insects should be acquainted with some cure for their bite; for whoever feels like me on these occasions will be glad to know of some alleviation. I am not able to sleep after the bite without applying something to the part; it was by accident that I first tried brandy, which had the desired effect; I have since applied spirits of hartshorn to the purpose; soft pomatum may do, or sweet oil, but spirits are the most effectual.

I wish to give an instance from my own observation, how very soon any house may be infested with these insects from one individual.

On the 20th of August last, early in the morning, I received a bite from a bug; I struck a light, caught the insect, and put it in the vessel of water, where it remained till I got up; it was the largest I had ever seen. After being in the water about six hours it was taken out and put in a bit of cartridge paper; I forgot it for ten days, and when I opened it again I found it still alive; but much less in size: I made no further observation at that time. About the 10th or 12th of September I opened the paper again, and, to my great astonishment, found the old bug still alive, and eight young ones able to run about the paper. I took a glass to examine them: I found one egg not broke, but could find nothing of the shells of the other eight;

concluded they might have eaten them. The 16th they were still alive, but on the 18th I found the old one dead. On the 23d four of the young ones had made their escape; on the 29th I found one of them dead and three alive: they remained about the same size that I found them. They must have lived more than twenty days without food, how much longer I cannot tell; and the old one lived at least twenty-seven or twenty-eight days after confinement. Is it to be wondered that the good women find it so difficult to rid a house of these vermin? Wishing you every success in your useful and very entertaining work, I remain your very humble servant,

C. BENTLEY.

It is hoped this correspondent will pardon the Editor for suspending the publication of a part of this letter, as it respects a particular that requires to be corroborated by farther observations before it be submitted to the public.

MISCELLANEOUS LITERATURE.

Thoughts on Grecian and Gothic Architecture.

[Continued from Vol. III. page 132.]

•WHOEVER has read what has occurred on the subject of architecture in the preceding pages of this work, will be easily satisfied that it would be an abuse of terms to entitle what has been effected respecting either of these modes of building, A SYSTEM OF ARCHITECTURE; for both the one and the other em-

brace such a very small part of the art of building, as to preclude them from any sort of claim to the title of a system. *A system of architecture*, in the strict and proper meaning of the phrase, ought to include all that is required for arranging, distributing, and erecting buildings of every sort, in the way that is best adapted to render each separate kind of building firm, commodious, and suitably elegant; in which all the parts shall be so arranged as to make each building so perfect in its kind as best to answer the purpose for which it was intended: a considerable diversity, therefore, must be allowed, not only in regard to the nature of the ornaments that may with propriety be there introduced; but also in regard to the form, the proportions, and the lightness or massiveness of the parts of which they severally consist.

According to this view of the subject, that which has been hitherto denominated the *Grecian* style of architecture, I would call the architecture of a *colonnade*; and, instead of the Gothic style of architecture, I would say, the architecture of a *church*; so that, admitting each of these two kinds of architecture to have their respective merits, I cannot see how they should be said to clash with each other, any more than the properties of a triangle can be said to derogate from the constituent qualities of the square. In short, admitting that we were to allow to each of these two exertions in the architectural line as full a degree of applause as its most sanguine admirers can desire, it by no means tends to derogate from the merits of the other; on the contrary, were a dozen other successful efforts to be made, that were each equally perfect in its

kind as either of these two, and that had of course a tendency to render buildings different from these, and which were applicable to other purposes, perfect, and which could not possibly with the smallest propriety be executed in a style conformable to either of these two, each of these would only constitute a part of the grand body of architecture, that ought to be clearly understood before we could with any degree of propriety pretend to establish a scientific *system of architecture*, or any thing that could with justice be said to approximate towards that name.

So far, however, has the influence of prejudice prevailed over the dictates of sound sense, that men have been found in every civilized nation of Europe, for several ages past, who have not only not been ashamed to appropriate to a very insignificant branch of the art of architecture the title of a *complete system* of the art; but have had the arrogance to claim an exclusive right to dictate to all others, and to condemn as barbarous and uncouth every particular in the practice of this art that did not accord with the rules which their imaginary *SYSTEM* allowed: and in this they persist, although they have seen that during all that period of time, no person has ever been able to erect a structure, whether civil, religious, or military, that was any thing near so perfect in its kind as it might have been, which did not, of *necessity*, depart from many of those rules whose salutary influence these men wish to represent as universal. If this does not evince a bigotry similar in kind to that which for so many ages established the universal authority of the Roman pontiff, I do not know where to find a parallel to it. Even at the time

in which I write, there are splendid treatises issuing from the press every day, under the title of *complete systems of architecture* (and these are tolerated), which pretend to teach nothing else than how to measure the parts, ascertain the proportions, and delineate the several members of the five orders of columns of the Greeks and Romans executed in their different public works, and the adjuncts necessarily connected with these !!!

As bigotry is ever blind, so the efforts of a bigot are calculated only to blindfold, not to enlighten those whom they affect to direct. Hence we find, that the authors of such treatises, when they have measured with a hairbreadth accuracy the minutest parts of the particular object of their idolatrous veneration, and dignified it with the name of the perfection of perfections, I would say the perfection of Grecian architecture, which they cease not to proclaim the *acmé* of elegance, they find themselves forced at the same time to reject many other models of Grecian art equally authentic with that which they have chosen to consecrate, and which differ from it in some of their most essential parts. So feeble are their optics, that they can see no reason for such diversities; though the Greeks, who were a manly people, and thought and acted vigorously, perceived just cause for such deviations; and those in modern times, who dare to think after the same manner, see reason to admire the singular propriety of those aberrations which the little mind can never comprehend. A difference in regard to magnitude; a diversity in the distance of the principal point of view; a variation in respect to the ele-

vation of site; a diversity in the idea that the building was intended to excite in the mind of the beholder, and a thousand other circumstances that will occur to an enlarged mind when it contemplates the effect that ought to be produced by a magnificent structure, will suggest the propriety, and even the necessity, of varying the form of the members and the distribution of the parts of a building, if it be expected to produce the fulness of effect that it is capable of exciting in the mind of the beholder. But these ideas, though they were evidently familiar to the Greeks, are altogether beyond the grasp of our feeble system-mongers. I have often amused myself with figuring in my mind the picture of contempt with which Pausanias would look down upon one of these grovellers, had he but glanced over any of their systems. I figure myself as observing the emotions of this judicious old Grecian as he perambulated the gardens of Kew! and at the same time reading the pompous description of them by the vainglorious author and erector of those gingerbread gewgaws, which he has held up to public view as models of perfection in the art of architecture; in regard to which those who have a desire to satisfy their curiosity ought to lose no time, as it is said that his Majesty, much to the credit of his taste, has an intention of speedily removing them. *Specimen.* “The *temple of the sun* is situated in an open grove near the orangery, in the way to the physic gardens. Its figure is of the circular peripteros kind, but with an attic; and there is a particularity in the entablature, the hint of which is taken from one of the temples of Balbec. The order is Corinthian, the columns fluted,

and the entablature fully enriched. Over each column in the frize are basso relievo's representing lyres and sprigs of laurel; and round the upper part of the cell are suspended fruit and flowers. The inside of the cell forms a saloon richly furnished and gilt. In the centre of its cove is represented the sun; and on the frize, in twelve compartments, surrounded with branches of laurel, are represented the signs of the zodiac in basso relievo. This building was erected in the year 1761." Who would believe that this splendid imitation of the magnificent structures of Balbec was a pitiful thing composed of wood and plaster; the columns scarcely ten feet high!

There is not, perhaps, to be found in the history of man a more whimsical predilection for an object of taste that has continued to have an influence for so long a time as this is, though many instances may be found equally absurd that were admired for several years. The straight avenues and formal parterres of our forefathers; their trees cut into the form of birds and beasts, of pyramids, vases and arcades; their formal ditch-like canals; their squirting fountains, and vomiting fishes, have had their day, and are now sunk into their merited disregard. The stiff angular Frenchified cut of the male-coat of the present hour, though it has undergone various modifications since the days of Moliere, all of which we do not hesitate to call absurdly ludicrous, still radically keeps its ground; but this predilection is but of yesterday, compared to that to which I now allude: yet there is no mode that has ever been in fashion which exhibits a greater number of abortive attempts to combine ele-

gance with utility, than this system of architecture when it is attempted to be carried out of the walk for which it was invented, and for which purpose, perhaps alone, it is properly adapted, than what is called the Grecian style of architecture; which is, in all its principles and parts, so peculiarly stiff and uncomplying, that it refuses to adapt itself in any way to any other use whatever. Of the truth of this observation, we need only to open our eyes to obtain the fullest conviction: for, let us turn them how we will, we meet with incongruous attempts to combine the Grecian column with the necessary accommodations that are required in private habitations, in churches and other public buildings, in monuments, in screens, in furniture; and, wonderful to tell, even in bridges themselves; in scarcely one of which situations do I recollect to have seen it where it did not evidently tend to mar the elegance of the structure that it was intended to adorn.

I am aware of the inefficacy of reasoning, or even the power of ridicule, to counteract the influence of fashion, while it is in the zenith of its power. I am conscious, that Hogarth's dancing-master vainly correcting the elegance of attitude of the Apollo Belvedere, has had no effect upon the general attachment to the fashion so irresistibly ridiculed; though it is impossible to deny its power in producing the fullest conviction in the mind of every one who attends to it; for which reason I do not intend to encounter windmills, or rouse up sleeping lions, in order to oppose the influence of this *mania*; yet I cannot see that any harm can result from a good-natured attempt to re-

store reason to her throne at the expence of prejudice and whim. The supporters of this system ought to recollect the good-natured maxim, that "every dog should have his day." They have had their day for a sufficient length of time, and therefore it is but fair that they should yield now to good sense, the rightful sovereign, in regard to matters of taste as well as of all other human concerns; who, though he has been often deposed for a time, has never yet resigned his claim to the supreme command; and has been again and again replaced, when those who had usurped his throne thought themselves so firmly seated in it, that they looked down with disdain upon the first feeble attempts of the insignificant (as they thought) favourers of his cause.

Let it not, however, be imagined, that I mean to throw the smallest reflection on the Grecian colonnade, or the proportions and decorations that were invented by the Greeks for ornamenting that mode of architecture, both which I consider as excellent for the purposes for which they were contrived, and as indicating very superior powers in that justly celebrated people who invented it; nor can any one be more disposed than I am to admire the grandeur and elegance of those structures in which they were *thus* employed. It is not then the *use*, but the *abuse* of this species of architecture, of which I complain; and my object is rather to do justice to the inventors, by preventing their sublime ideas from being obscured by those degrading contrivances which their puerile imitators have fathered upon them, than to condemn them.

The colonnade, when applied to a superb building, simple and unbroken in all its parts, isolated from all others, and of moderate dimensions, produces at all times a noble and striking effect, that no person, who has a soul susceptible of impressions of this sort, can behold without a sensible and pleasing emotion. When viewed at a considerable distance, the amplitude of the shade gives a distinctness to the form and a boldness of relief, which, when combined with the unbroken uniformity of the wall, gives a luxuriant sweetness to the effect, that is strongly impressive. As you approach nearer, the structure seems to grow in magnitude; and the bold projections of the cornice and entablature, now necessarily viewed from below, produces a rich grandeur of effect that no person who dares to own his feelings will venture to deny. This is the only situation in which this species of ornament can be displayed to the fullest advantage; and this is the very situation in which the inventors of it have chosen to exhibit it. No wonder that men who have seen it in this situation have admired it; but it is truly wonderful that those who have actually seen it thus exhibited (which I have never done), should not have been sensible at the first glance, what a very different sensation is excited by those pitiful imitations of it that they see so profusely scattered throughout all the regions of Europe, and thus have been induced to investigate the cause of this peculiarity. No such attempt have I ever met with. The only circumstance that I have found in their writings, that shows they must have felt the effect to which I allude, is, the unvarying admiration with which those who have had access to view the finest

remains of antiquity talk of them, and the infinite disparity that they admit exists between them and those modern structures in which the same style of architecture has been employed, and the same proportions most scrupulously adhered to. Allow me now, when I endeavour to rescue this long degraded art from the obloquy to which it has been subjected from the injudicious conduct of its admirers, to point out one characteristic excellence that attaches to it, and that seems to have wholly escaped the notice of its warm panegyrists; although I have no doubt, that when it comes to be properly adverted to, it will be admitted, that it is this peculiarity, more than any other circumstance, which gives to it a decided superiority above every other mode of building that has been ever exhibited in Europe. I here allude to the striking effect that a Grecian colonnade is adapted to produce when it is viewed as a *ruin*. If we could suppose that men, when they were contriving to erect a building that was to be constructed of the most durable materials they could procure, and which were obviously intended to stand as long as the art of man could effect, had in their eye the appearance which that building would exhibit when it fell at last into ruins, we should be compelled to allow to the Grecian artists a very high degree of excellence indeed; for I conceive it will be admitted, that no other structures that have hitherto been contrived by man (not the Gothic church itself excepted) can be compared with them in this respect. In the state of a ruin, all the characteristic defects of this style of building disappear, and those excellencies which tended to render it pleasing in the perfect building, acquire

additional powers that render it an object superlatively attractive. The bold projections now acquire additional power; and, suspended by the force of the cement (which age alone can give) and the counterpoises that accident sometimes provides, they assume an appearance that is highly picturesque. The light too, often seen between the yawning gaps of the tottering architrave above, gives to these massy shades an effect that is awfully sublime. Nor do I conceive, that the most partial admirers of any other kind of building would have the smallest hesitation to give the preference to these ruins over those of any other structures whatever. I have a pleasure in pointing out these unobserved excellencies of this mode of building, because it ought, in some degree, to weaken any surmise that the following observations are dictated by prejudice.

In those innumerable attempts that have been made to foist the Grecian column into every architectural design in modern times, all the circumstances that contributed to render it such a striking ornament in ancient structures seem to have been entirely overlooked. The very windows, in modern times, are so indispensable for convenience, and so incompatible with the necessary simplicity of the colonnade, as to render every attempt to combine them altogether incongruous. The smallness of a private building, the number and necessary disposition of these harsh points, and the extent of a public dwelling, where numerous apartments are required, thus freckled all over, alike tend to render this kind of ornament inapplicable to them. From the prevailing idea, however, that no fine building could deserve any degree of approbation

without columns, it is wonderful to observe the diversity and the awkwardness of those contrivances that have been adopted for the purpose of introducing them. Like Bayes, with his simile in the "Rehearsal," they must have it here, though altogether out of its place, because a simile is here indispensable. It is painful to dwell upon these absurdities; I shall, therefore, glance as briefly as possible at a few of the least exceptionable structures of this kind in the neighbourhood of London, merely as illustrative of the foregoing position.

With regard to private habitations, I pass by the Mansion-house, because it is admitted pretty generally to be a very faulty specimen of Grecian architecture, and go to the India-house in Leadenhall-street, which is not only the newest, but also, so far as I have been able to remark, the most faultless structure of the kind in London. In this instance, the hampered closeness of the situation is in favour of the building, because it prevents its most striking defects from being perceptible: you are almost under the columns before you can observe them; and the windows between these columns come to be then considered individually, and thus appear nothing incongruous; whereas if they had been seen at such a distance as to have been considered only as parts of a whole, they would have had the effect of appearing to be deep and harsh patches which tended to mar that soft and harmonizing effect that is so much wanted in structures of this sort. This unpleasant effect of the windows between columns, is to be observed in innumerable colonnades of a similar kind that catch the eye from time to time as you travel through this country. In one respect, however, this

colonnade is greatly superior to most that are to be found in this country; the columns rise from a moderate elevation only, and are not supported upon arcades, as if raised upon stilts, like those at Lord Spencer's house in the Green Park; which is one of the numerous devices that have been adopted for conjoining things that are naturally incongruous. The poverty of the two ends of the India-house, freckled with so many patches, does not, in its particular situation, become conspicuous, as it must have done, had it been possible to see it in any situation where it could have been considered as one whole.

This shall suffice as to private houses; let us now consider the effect of the column as applied to dwellings of larger extent, or royal palaces.

Inigo Jones, who, many persons assert, was the first architect that ever Britain produced, has left detailed plans and geometrical elevations of a palace of this sort, that was intended to have been built at Whitehall: from which, together with the specimen of it that was actually built, at the Banqueting-hall, a perfect idea may be formed of its general effect considered as an object of taste. There, the incongruity of the double row of pilasters that ran along the whole, hung in some places to a triple or quadruple range, and the puerility of their effect, which were evidently introduced with a view to reconcile irreconcilables; the still greater puerility of the clusters of diminutive columns stuck about the windows, which are a necessary consequence of that blind idolatry that I have so lately reprehended; the trifling effect of the colonnades that were occasionally introduced, so extremely dispro-

portioned in size to the general magnitude of the whole pile of which they formed so small a part, and the low and heavy flatness of the general mass, are all such striking defects as cannot escape the notice of the most cursory observer, who has not his understanding blinded by prejudices imbibed from the school of fashion. If the palace of Windsor should be removed, and this palace, or that of Hampton-court, or any other palace constructed on similar principles, were put into its place, would there be a single unprejudiced person who had ever seen the two, that would not deplore the change, as one that was more to be lamented, as an object of taste, than words could ever express? Yet there are many men who, in spite of this, will still maintain, that the structure which all the world admires is barbarous, and the other the perfection of elegance as an object of taste!

As an instance of the effect of applying this style of architecture to public buildings, I shall merely glance at St. Paul's Church, London, whose external appearance alone shall be the object of our present elucidation.

Sir Christopher Wren, who planned this church, was an architect, as is very generally known, who ranks among the first in respectability in this country; so that if neither he nor Inigo Jones could so manage this system of architecture, which they were both taught in their youth to consider as indispensable in every building in which superior elegance was aimed at, as to avoid evident incongruities, it will afford demonstrative evidence that the task is, at least, difficult, and a strong presumption that it is absolutely impracticable.

In this structure, the double range of columns in front, one above the other, is an incongruity so strikingly obvious, that the most inattentive unprejudiced beholder cannot fail to remark it as an absurdity of the most glaring sort, and which no man of talents and taste could have fallen into, had not his mind been gradually familiarized to such things by a course of studies calculated to mislead the judgment and pervert the taste. I take no notice of other blemishes in the west front, because my intention is not so much to criticise the artist, as to lead to a right judgment respecting the principles of the art. In this view, I must call the attention once more to the Grecian columns introduced so very much out of their place, still accompanied with their entablature and cornice, near the top of the west turrets, an evident imitation, and a clumsy one it must be owned, of the light and appropriate pinnacles applied for similar purposes on the top of Gothic spires and monumental turrets.

The double row of pilasters stuck upon the walls all round the other parts of the building, with the heavy though unmeaning bands of architraves, cornices, and basements, enclosing the (double tressed) windows, so nearly resemble the broad and weighty gold lace on the coat of his majesty's servants surrounding their pocket-holes (a fashion now antiquated and deemed absurd), that it is impossible not to think of them together, and to put this obvious question, What is the reason why one mode does not go out of fashion as well as the other? The central dome too, in order that the never-ending column may be again introduced, is deprived of that plain rotundity which alone could

give grace to that simple form (a fine example of which, though on a much smaller scale, is to be seen in the back part of the rotunda of the Register Office in Edinburgh), and is dug out into deep and disgusting cavities, that in many respects (regularity alone excepted) resemble the cavities eaten by some kinds of insects into the very heart of trees. Assuredly no one will say, that in that position these columns are calculated to produce any thing like the idea of simple magnificence, which the Grecian colonnade in its original appropriation was so happily adapted to excite. But even here we have not done : above the top of the dome the cupola rises, still supported by its pigmy pillars. Pillars seem so entirely to occupy the mind of these artists, that they can think of nothing else. It indicates a poverty of ideas that would be wonderful in men of talents, could any thing be wonderful respecting the human mind when it is blinded by prejudice. It reminds me of a visit that I paid many years ago to the house of a nobleman who had been then recently exalted to the peerage, whose cranium had been so completely filled with coronets, as to give no room for any thing else, like that of our artists with their columns. His gates were surmounted with coronets ; a coronet rose above the top of the weather-cock ; his doors, his windows, the shields of his locks, were adorned with coronets ; the balustrades of the staircase, the handles of his bells, the knobs of his fire-irons, were fashioned into coronets ; coronets were the finishing ornaments of his mirrors ; the backs of his chairs were worked into coronets ; and the roofs of his beds were surmounted by mafsy crowns : in short,

you could look no way, but coronets were the first objects that caught your eye; and, that nothing might be wanting, a coronet was found in the bottom of his porcelain *pots-du-chambre*. Were I to search the world around, I could not find such a perfect parallel to our artists as this affords. It is one of the many instances that we meet with, well calculated to humble the pride of man: for while, under one point of view, he seems to be nearly equal with superior intelligences, in another, he claims kindred with the merest animals that inhabit the earth. The creature of folly, caprice, and whim, he is governed by fashion and enslaved by prejudices; and he has too often occasion to feel, that that reason on which he prides himself so much, instead of being an unerring guide, as he vainly boasts, is little else than a phantom, which he thinks he follows when he is in fact busied with other pursuits.

I need not extend these reflections to the puerile effects that result from the misapplication of Grecian columns as they are exhibited in funeral monuments that are shocking to every beholder; in ornamental screens, a striking example of which is wofully exhibited *in terrorem* in Pall-Mall; in bridges, in furniture, in candlesticks (I wonder that they have never attempted it in candles), and innumerable other devices that catch our eye whichever way we turn it; for the incongruity of these, after what has been said, will be sufficiently obvious: I, therefore, willingly take leave of this disgusting part of our disquisition; and shall consider in a subsequent number, the effects of the Gothic system of architecture, as it has been called, considered as an object of taste; for hitherto we

have only considered its various devices as adapted to utility and convenient accommodation.

On the comparative influence of agriculture and manufactures upon the morals and happiness of a people, and the improvement and stability of states.

[Continued from page 137.]

IN the former paper on this subject it has been shown, that the prosperity of a country which results chiefly from manufactures, though it extends its influence to agriculture, and *seems* to promote it, in as far as it tends to raise the price of land, and to make the farmer more wealthy *in the mean time*; yet that in *reality* it stops the progress of rural improvements, and actually tends to diminish the total amount of human sustenance produced in the country.

In this way it must happen, that in a manufacturing country, which can have easy access to other countries for the transportable articles of sustenance, recourse must of necessity be had to these countries for those articles, without attempting to make sufficient efforts for producing in its own territories the food that is necessary for sustaining its own people.

In this way the support of the people must be rendered not only more expensive, but also much more precarious than it otherwise would have been; and, by consequence, the prosperity thus obtained must be extremely unstable. Nor can either the productiveness of that country, or its population, be ever carried nearly to that height of which they are naturally sus-

ceptible ; far less can the felicity of its inhabitants be secured, or the internal tranquillity of the state be maintained for any continuance of time.

The demand for manufactures, especially to foreign parts, must ever be precarious, and liable to great interruptions. Not only may the demand be slackened from a capricious change of taste, or a casual disgust in the people ; but it may also at pleasure be affected by the political operations of government ; which, by imposing duties, may make a total revulsion in the stream of trade ; or, by stopping the course of justice (as was done in America), may make the recovery of just debts impossible, and thus occasion innumerable bankruptcies. In all these ways many thousands of people, who were in the practice of living in affluence, may in a few months be laid entirely idle. And all the farmers and mechanics, who depended on these manufactures for their own custom, must in like manner be reduced to the greatest distress.

Should this, however, be only a *temporary* interruption, the evil, though great, may perhaps be bearable for a time ; but if it shall be *permanent*, what must be the consequence ? Either the persons who are thus deprived of their means of subsistence must, at a great expence, be repressed by a military power from committing enormities, and thus be driven to seek shelter in some other country, where their manufacturing knowledge may perhaps make them welcome guests ; or they must prevail against the power of law, and pillage and anarchy must take place.

In case your manufacturers are driven abroad to other countries, your manufactures and your popula-

tion are both permanently diminished, and with them the prosperity and the wealth of all who remain behind is decreased; and consequently the national resources fall off. But when the resources of a once wealthy government fail, it is impossible to bring it back to that kind of prudent economy that might have been practised had it never known excess. Taxes then become excessive. - The remaining manufactures, under the rigorous execution of revenue laws, languish for a time, and then expire. The people, in the mean while, seeking for refuge in happier countries, retire in great numbers; and the population diminishes in a most astonishing degree. Such has been the fate of Spain, which was once a wealthy, a manufacturing, and a populous country. Its population in a short period has sunk from twenty-five to eight millions of people; its manufactures are ruined; and its agriculture is in the most languid neglect. But such, in a still more conspicuous degree, has been the miserable reverse of fortune that Antwerp has undergone; which three centuries ago experienced a flush of prosperity arising from an inordinate success in manufactures and in trade, that has no parallel in the history of past times; but which Britain at present is in the train of imitating. May her fate be different! For the prosperity of Antwerp was like the flutterings of a butterfly, gaudy at noon, and brilliant beyond compare in the bright sunshine of a short day; but when the chilling damps of the evening approached, and the tempests of adversity arose, it sunk at once to death, and was buried in perpetual oblivion.

It is by no means the wish of the writer of this

essay to discourage manufactures; nor is there the most distant reason to think he could do it if he would; but he looks forward with a philosophical coolness to the probable issue of undertakings, in which men engage at present with the same kind of ardour and hilarity that those who have once experienced the joys of wine feel when they bring the glass to their lips. To try to persuade these men that they did wrong, would be the height of folly, and which he will not attempt.

Yet, while those jovial unthinking men are allowed to indulge in convivial joys, others may seek a recreation of another kind. They may soberly inquire if there be a possibility of augmenting the population of their country to an equal or greater degree by prosecuting rural occupations? They may examine if both employment and sustenance could be provided at home for this increased population, without being obliged to depend upon the aid of others for their support? And whether, by doing so, they would not provide for the welfare of the people, and the strength and stability of the state, much more effectually than by the other plan of conduct?

No one will deny, that it is the number of the active and industrious inhabitants of a state that in all cases form the truest criterion of its resources and its strength; and it will be readily admitted, that if the same number of men can be supported in the operations of agriculture, and the arts of internal economy depending upon it, as in manufactures, the first will be more uncorrupted in their morals, more regular in their conduct, and more steady in their industrious exertions than the latter. It follows, then, that the more the

agricultural class of citizens can be increased, the better it will be for the state ; and of course we ought to conclude, that this increase should suffer no bounds to be set to it, but that of the possible productiveness of the country.

Nothing can be more certain, than that the productions of a country can be increased by human exertions ; and that this increase of produce can, by judicious management, be gradually augmented in a country which admits of being cultivated almost without any limitation. If these facts be admitted, it will follow, that by due attention to carry forward improvements in agriculture, the population of a country may be gradually increased to an indefinite degree, and the people still find abundant subsistence from the productions of their own fields, even where there seemed to be no superabundant produce at the time the population began to increase.

But in this case the exertions to augment the produce of the soil must be uninterrupted. In the melioration of barren soils, it may be admitted as a fundamental axiom, to which there is no exception, that every thing depends upon labour ;—"all is the gift of industry." Nor can it be doubted, that, in general, extensive and important meliorations originate in the *actual culture of the soil* : nor can the greatest possible quantity of human sustenance ever be obtained from the soil, except by means of cultivation, aration, or digging of some sort or other ; for it is by means of these operations alone that a soil, originally barren, can be brought to be highly productive ; or that manures can be made to produce their fullest effect, with-

out waste or an uneconomical profusion in their application.

, From this mode of reasoning it appears, that every country which is not already brought into the highest possible state of productiveness admits of an increased population beyond the numbers it can at present subsist, without being obliged to have recourse to any other country for provisions; but that this increased population can only be supported by augmenting the quantum of actual culture in that country, and increasing the quantity of labour employed on rural operations;—in other words, by increasing the number of husbandmen.

The natural inference from these premises is, that in a country where the inhabitants are not allured from the labours of agriculture by a prospect of engaging in more lucrative employments, the population and the fertility of that country may go on, increasing together, for an indefinite number of ages without interruption, till both of these shall at length attain a height to which no person can pretend to set bounds. It is, therefore, possible to preserve a state purely agricultural for ages, in which all the inhabitants shall find constant food and employment, without being obliged to have recourse to foreign aid either for the one or the other.

And if our reasoning in the former part of this essay has been well founded, it will follow, that such a state will enjoy a prosperity more certain and more permanent, and its inhabitants experience a greater degree of tranquillity and happiness, than if they were employed chiefly in manufactures. In the one case,

its prosperity would be moderate and uninterruptedly progressive, but secure, and liable to few interruptions. In the other case, its progress would be at times rapid; —it would not seem to run, but to fly; but, at other times, it would not only stop, but be retrograde.

By a state purely agricultural, I must be understood to mean a state in which the inhabitants are wholly, or chiefly, employed in the concerns of domestic economy; and in the providing of food, tools, clothing, &c. for the comfortable subsistence of one another. Of course, manufactures, and all that division of labour which is necessary for carrying on either agriculture or other arts with economy, may, and indeed must there prevail before the state can attain its utmost degree of perfection. Manufactures, when thus carried on for domestic accommodation, necessarily promote agriculture; and the demand for these, by being steady, never produces those dangerous fluctuations to which manufactures, for foreign consumption, are so remarkably subjected. Trade, likewise, in as far as it tends to facilitate the interchange of commodities within the state, will here be a necessary assistant; but foreign trade, and the manufacture of goods for the accommodation of other nations, seems to be in no degree necessary to the well being of the state; but is evidently calculated to disturb that political tranquillity on which the happiness of the people, the stability of the state, and its progressive improvement, so materially depend.

On these principles it would seem that the Chinese system of government has been founded on wisdom; as, by adhering to the domestic and agricultural sys-

tems; that country has continued for a series of ages, now innumerable, in an uninterrupted progress of improvement; till the productiveness of its territory and the extent of its population have increased to a degree of which we in Europe can have no adequate conception. During the continuance of its progress, the mighty empires of the Assyrians, Medes, Persians, Babylonians, Greeks, Carthaginians, and Romans, have been successively swallowed up by each other; not to mention those swarms of ephemera states that have sprung from the ruins of the last, fluttered a few hours in a transient day, and then been swept from off the stage, leaving scarcely the memory of them behind. While these mighty states have successively sprung up and disappeared, this singular nation alone has continued to augment in vigour and in strength. We, it is true, condemn its policy as unwise; but if wisdom consist in warding off calamities, and promoting the happiness of the human race, with what justice can we brand them with that opprobrious epithet? Had all the nations above mentioned, which we dignify with the epithets of enlightened and heroic people,—had they all, I say, adhered to a policy similar to that of the Chinese, what wars, devastations, massacres, and bloodshed, would have been prevented? How many myriads of widows, whose hearts have been torn with anguish, might have enjoyed life with tranquillity, and resigned their souls in peace? How many orphans that have been exposed to the miseries that unprotected youth is liable to, would have been bred up to industry and happiness? What an infinite number of barbarous atrocities, at the bare

recital of which the heart shrinks into itself with horror, would have been prevented? And, at this moment, how many myriads of people would have been enjoying the blessings of life on this globe, compared to the few insignificant creatures that are thinly scattered on its surface; and who seem to have no other object than that of tormenting and of massacring each other? Were a superior being to look down upon this globe, would HE bestow the epithet *unwise* upon that nation, which, attentive to the welfare of its own people, was continually occupied in preserving their internal tranquillity; and which had cautiously shut its doors against the introduction of those evils which had made a desert of all the rest of the world? If his eye glanced upon the late fertile and peaceable province of Bengal, would he not say, that opening her gates, so as to admit these ravenous strangers, would be as if the mariners, who were forced to winter on Greenland, had opened their doors to admit the bears when they prowled around for prey? Yet it is these people that we brand with the epithet *unwise*. Never, I think, was a word so improperly applied.

I wish not to make an indiscriminating eulogium on that nation, like those which, for the purpose of satirizing others, have so often been bestowed upon it by fanciful writers; but when facts thus come to corroborate reasoning, it would be absurd not to take notice of them. The incomparable permanency of China; its progressive improvement during so many ages; the immense degree of fertility it has thus attained; and the innumerable swarms of people it supports; are clear and undeniable evidences of the vast

superiority of the agricultural system of employment over the commercial and manufacturing system, which is so much the idol of worship by the people in Europe; and which necessarily leads to foreign wars and devastations, internal tumults and disorders. Massacres, conquests, revolutions, without end, are the accompaniments of the one, while unabating peace, tranquillity, and happiness, are the result of the other.

[To be continued.]

TWO SINGULAR CHARACTERS.

[From Gorani.]

[Continued from page 236.]

It was also at Florence that, recollecting the figure and conduct of the monk, who in the felucca seemed so much attached to the steps of Ariston, I inquired how such a man, who seemed so little formed to be his friend, could acquire the ascendancy that he seemed to have over him.

This monk, a disgrace to his situation and to humanity, was of the order of Recollets. After a variety of tricks, and behaviour such as I cannot describe without offending the ears of the reader, he was sent to Naples, where his complaisance gained him the friendship of the father provincial, who gave him liberty and permission to confess: and to confess in Italy, is to unite in one person every means of seduction.

Eighteen months had this hypocrite fashioned according to his will the consciences of the credulous Neapolitans, when a young lady, very handsome, came to augment the number of his penitents. She pleased him; he seduced her, and proposed running away

with her, to a foreign country, where they could be married. She consented to it; and one morning disappeared, carrying off from her parents every thing that she could lay her hands on. Her package might be worth about two thousand crowns: and when they arrived at Leghorn they embarked on board an English vessel, which carried them to London.

This town, whose manners and language are so different from those of Italy, did not retain long this amorous couple, who, not being able to express themselves so as to be understood, set out for France. They travelled over great part of it, and at last settled at Paris. However considerable their funds may have been, augmented by what the reverend father had been able to cheat from two of his penitents, they lowered in proportion to the expences which they had allowed themselves. Jewels, clothes, and every other article that the monk could lay hold of, now became a supply for them; and these he the more willingly disposed of, as he had already done so with regard to their owner. For, in fact, so far from performing the promises he had made to this young unfortunate creature, he sold her to one of those disgracefully celebrated women who live by others' prostitution; and it has never been since known what became of her.

The fears of being discovered and punished, and the present misery that he was in, made him quit Paris and go into Spain, where, as well as in Italy, people of his cloth are objects of public veneration. Madrid, however, and all the great towns in Spain, not offering him those facilities upon which he had counted, he went to Portugal, accompanied by his vices.

He was admitted by the Hieronymites of Belem for the interior service of their church. Being honoured with the secret commissions of the monks of this convent, he arrived at the post of vestry-keeper. As he knew how to bring grist to the mill, he might have fixed himself in this monastery, and have finished in quiet a life blackened with crimes. But the measure of them was not yet filled. His benefactor, the general of the order, experienced that there are characters so very base that nothing can check them. He had allowed the Neapolitan access to his apartments; who, tempted by the opportunity, stole a diamond cross, a very handsome ring, and upwards of two hundred pieces of gold.

Having done this business, the Recollet fled to Hamburgh by means of forged passports; from thence he ran over Germany, came to Switzerland, and presented himself to Felix, whose history and subsequent establishment in that country he had learned. It was not long before Felix found out the real character of the stranger, and took immediate means to rid himself of him.

At length the Recollet, less tired with his perpetual running about, than frightened by the cries of his conscience, and above all by the state of want to which he found himself reduced, had recourse to the general of his order. He wrote him a letter, palliating as well as he could his first pranks; for which, and his apostasy, he asked pardon, and entreated readmission into the order.

The general, delighted at the idea of bringing back to the fold a wandering sheep, granted all his requests;

and, in order to skreen the new penitent from the attacks which the relations of the lady whom he had run away with from Naples might make upon him, he sent him in submission to Rome, with orders to obtain absolution from the Pope. In this new expedition he became acquainted with Ariston. The conduct of the Recollet during the voyage plainly showed, that in resuming the monastic habit for the twentieth time, he had not put off the old man.

Whatever may be the cause, the facility with which the chiefs of the religious orders pardon the crimes of their monks, which are a disgrace to society, indicates the manners of Italy, and of those countries whose soil is dishonoured by such vermin. The life of this Recollet had not any thing in it surprising to the Italians.

This man brings to my remembrance a fact which was related to me by father Jacquier, with whom I made an acquaintance during my first travels into Italy. There was upon the coast of Calabria a convent of Recollets, which was destined as a prison for those individuals of the order who had been guilty of great crimes without having had the address to conceal the knowledge of them from the public. One of these prisoners found means to get rid of his brethren, by selling and giving them up to a Corsair from Algiers. Being now alone, and fearful of a discovery, father Pascal (that was the name of the monk) embarked for Holland. Less hardened than he thought he was, he felt remorse for what he had done, and wrote to the father guardian; who, as he had been fully informed of what had happened, referred him to the general, who

Plan for Bettering the Condition of the Rich. 303

ordered the culprit to come and prostrate himself at the feet of the Pope, whose clemency was well known. The Pope at this time was Ganganelli : no one knew better than this pontiff how to conciliate the interests of the tiara with what the circumstances of Europe at that time exacted.

When the penitent had committed to the ears of the Pope a partial detail of his crimes, his holiness said to him, " I absolve thee, father Pascal, on condition that thou performest a sincere and rigorous penance for thy enormous crimes. What ! being a priest, confessor, and missionary, characters which imposed upon thee the exercise of every virtue and the practice of every duty, have only served to make thee commit crimes with impunity ! Thou hast sold thy brethren ; their slavery is the fruit of thy rapacity !" — " Ah, most holy father, if you knew what sort of brethren mine were, you would not, perhaps, think me so culpable. One of them was an accomplice in five poisonings ; another had assassinated a boy after ——— ; in short, the least rogue had killed the guardian, who was not better than himself." — " Ha ! wretch," replied the Pope, " wast thou their judge ? I give thee absolution ; live in peace if thou canst."

Second Letter of the Secretary to the Society for Bettering the Condition, and Increasing the Comforts of—THE RICH.

SIR,

Threadneedle Street, Dec. 6, 1800,

ENCOURAGED by the insertion of my former communications, and prompted by the

204 *Plan for Bettering the Condition of the Rich.*

feelings of philanthropy; I resume the melancholy (but I hope not useless) task of laying before the world a true picture of the unexampled sufferings of the rich.

Among the many misfortunes to which this unhappy and unpitied class of the community are liable, few are greater than those which arise from excess of *diffidence*. The pitiable case of this set of sufferers has been so generally overlooked by the world, that I shall not be surprised if the truth of this position should, to many, appear to be of a disputable nature; yet I hope to be able to bring satisfactory proofs that the rich, sir, are in the highest degree *diffident*, both of their taste and understanding; so much so, indeed, that they seldom dare venture to consult either the one or the other, but yield themselves, with more than Catholic resignation, to the guidance of *fashion*. Lavater says, that a man's dress is the table of contents of his mind and character; and his opinion is completely justified by the instance before us; for, as imitation without the guidance of *taste* is the first principle of their dress, so is imitation without the guidance of *reason* the first principle of their characters.

Now, sir, as nobody can be a greater admirer of humility than myself, I have a fellow-feeling in this case, as for a favourite failing of my own; and I believe it is my only fault. But really it is a pitiable case to think that men of sense even (merely from the accidental circumstances in which they are placed) should be obliged to submit so entirely to the opinion of the world. It is, sir, a humility *more than evangelical*, and an excess of meekness that, originating in the first of virtues, has degenerated into a disease.

Instances of the pernicious, nay dreadful consequences that it has produced are so numerous, that they scarcely need be mentioned. Nor are its depredations confined always to the wealthy. The disease is certainly contagious, and is frequently communicated, like other contagions, by contact, even to the poor, who are otherwise as little diseased in their minds as in their bodies. A distressing instance of this kind is just now before me: the daughter of a country clergyman, an amiable girl, in the bloom of health, and in the full possession of all her faculties of body and of mind, came up to London last spring on a visit, at the pressing invitation of a distant and noble female relation; but she had not been in that society above a fortnight before she caught the infection, the first indications of which were exhibited by a fiery redness in her cheek; not that delicate hectic glow which gives such a melting softness to the features in the first stage of a consumption of the lungs, but a fierce burning-like red that was better calculated to frighten away an admirer than to invite him. At this first symptom I began to tremble for her fate; and every time I saw her I could not help perceiving the advances of the disease. When her faculties were in full exertion, her reason told her, that health, innocence, and clean linen, were the most attractive graces that could adorn youth; but by imperceptible degrees *finery*, though ever so tawdry, appeared elegant. A hoyden gait and unmeaning stare were deemed indispensable ornaments; and so far at length was her reason subdued by this fashionable *diffidence*, that she was constrained by it, within the course of one month, to order new clothes, *as they*

306 *Plan for Bettering the Condition of the Rich.*

were worn, to the full amount of one year's income of her father's living.

Nor is this mania confined to dress: it extends to manners, accomplishments, amusements, opinions, &c. &c. Hence men of fortune emulate grooms in their dress, and sailors in their gait. Hence every young lady must learn to sing before she can speak, and thump for hours together on a grand piano-forte, when Nature has denied her both ear and taste. Hence school-girls, like Sallust's Sempronia, dance *too well*.* Hence so many, to whom music is as fatiguing as Italian is unintelligible, submit to be tortured twice a week at an opera; and, with a resignation truly philosophical, conceal the torment that they suffer, and even pretend to be delighted. Hence also too many of our ladies, amiable enthusiasts in this mistaken humility, though possessed of complexions at once expressive of health and delicacy, submit to disfigure their faces with paint, and to make what surpassed the colouring of Rubens, resemble only the picture of an Eve daubed on a sign-post. Hence so many bad shapes, which might have been concealed, have been exposed through muslin drapery; and so many lovely shapes have been deformed with pads: and all this they bear without complaining, with a resignation almost ostentatious. I have somewhere read of a convent of holy nuns, who, to avoid the brutal violence of a victorious army, with vestal fortitude disfigured their faces and persons with knives and scissars, choosing rather to be objects of disgust than of desire. I at first was near believing that this was the intention of many of our ladies of wealth and fashion, they have

* *Salutare elegantius quam necesse est probæ.* Sall. p. 21. Delph. ed.

so completely produced the effect; but I soon observed, that the *rest* of their deportment was not *quite* consistent with such pure intentions. I have, therefore, attributed it to their modest deference to custom and mistrust of their own better judgments; for I cannot do such injustice to their understanding as to suppose that they do this in hopes of beautifying themselves.

But, sir, the effects of this mistaken diffidence among the rich, are not confined to the softer sex, nor to dress and amusements. Policy, religion even, and philosophy have all bowed the head to the same throne. This inveterate disease is the cause of nine-tenths of the infidelity in the kingdom, though it passes on many occasions unobserved. Those who would have believed *any thing*, and been *crusaders*, in the *tenth* century; are *philosophers*, and believe *nothing*, in the *eighteenth*: and this merely because the fashion is changed. Most of the *free-thinkers* (as those who think not at all affect to be called) that we meet with, are of this stamp. They have heard the profound doctrines of modern philosophy pronounced with oracular assurance; they have not renounced, but endeavour to suppress their own belief; and, to comply with *custom*, have modestly allowed that what they had hitherto thought *conviction* was only *prejudice*. These swell the numbers of the modern illuminati, and, like cyphers in notation, though, from their insignificance, of no value in themselves, yet add considerably to that of their leaders. And hence the honest zeal of our divines will, I fear, have no more success in suppressing infidelity at present, than the mistaken bigotry of king Stephen's clergy in

308 *Plan for Bettering the Condition of the Rich.*

extirpating long-toed shoes and chains to the knees: both are *mere fashions*, both are *equally irrational*; and the one will pass by in its turn, as the other did before it.

But to return to my subject, the melancholy catalogue of the sufferings of the rich. Another of their misfortunes is a disease so dreadful and incurable, that even the advertising physicians have not yet promised to remove it. This, sir, is a disorder much resembling the palsy, but wholly confined to the wealthy, and is generally proportioned to the riches of the sufferer. One who is bed-ridden is not more helpless than a patient under this complaint. He cannot walk, but must ride in a curricule to visit at next door. He cannot write even a billet-doux, but must have recourse to his valet de chambre. He cannot use his own judgment (even where fashion does not dictate), but refers every thing, however important, *even his private pleasures*, to a favourite domestic. A female patient is as immovable, without the assistance of a pair of horses, as the coach she rides in. Her dress is not her own work, but her woman's and her perfumer's; and rouge, the present substitute for the cestus of Venus, is administered by her waiting-woman. In this distressful condition she is obliged to be dragged through life, without the power to assist herself in any way, unless it be by improving her understanding with novels, sweetening her temper with scandal, and mending her fortune and purifying her morals at the faro-table. Of any thing else the limbs and senses of these delicate patients are utterly incapable, and their attendants supply the melancholy defects in a very imperfect manner. Hence the num-

ber of servants in great houses, instead of being mere instruments of luxury, are generally as necessary as a nurse to one struck with the palsy. Hence, too, the power of these substituted tyrants over their helpless superiors, is as absolute as that of a Turk over his slave; so that, in all great families, they are indeed the masters.

This disease likewise produces consequences of the most melancholy nature, particularly in those two great concerns of fashionable life, gallantry and politics. A patriot member cannot discover the necessity of his abandoning those wise measures which he had hitherto applauded, without his servants publishing to the world the exact amount of ministerial gratitude; nor can an *arrangement* be made with a woman of fashion without the knowledge of her waiting-woman, who, like a manifold echo, loudly repeats to the world all that passes, and more than that.

But, sir, the effects of this disease manifest themselves under an infinite diversity of forms; one of the most common, and which in some degree affects the whole, is a kind of continual lassitude, and at the same time restlessness of mind, which they call want of amusement. Some superficial observers will, perhaps, doubt this fact, and allege that the wealthy have the best means of entertainment; and, in fact, that they swarm in every public place. But, sir, public places, though fashion obliges them to go there, give as little satisfaction to these persons as a city feast to an invalid who has lost his appetite. Only observe what vacant faces meet your eye whichever way you turn yourself in places of amusement. See these men of pleasure (as they call themselves) gape at a concert,

310 *Plan for Bettering the Condition of the Rich.*

loll at a ball, pick their teeth at a *conversazione*, and drown the few ideas they have at a feast. They do not go there through choice, but are carried thither by the internal preponderance of that disease, just as the swine in the parable were driven into the lake by the devils that had entered into them, in spite of themselves. Can any body suppose them amused? No, sir; and the consequence of this wretched *ennui* is, that some of these pitiable objects, with magnanimity like Cato's, seek comfort for the misfortunes under which they suffer, in stoicism; and, considering that happiness consists only in apathy, wisely seek it at the bottom of the bottle, by drowning all their senses in intoxication: for I cannot think, with some superficial observers, that these persons, if they sought the pleasures of sense, would do it by closing up the avenues of every sense by which those pleasures were to enter.

Others there are who seek relief in endless activity, and, to avoid the horrors of *tedium*, undergo the most violent exertions, and lead lives more laborious than that of a Welsh curate's Sunday, or than the worn-out post-horse that drags them; travelling post through Italy in search of *vertu*, hunting foxes and steeples, and riding their own matches at Newmarket; never easy in one place while there is another to go to; like Cæsar, *nil actum reputans si quid superesset agendum*. The penetration of these unhappy sufferers is as much to be admired as their misfortune is to be pitied; for it is plain, from these symptoms, that they have discovered the source of their complaint to be in themselves; to consist in the emptiness of their own minds, which, like green spectacles, give the same colouring

to every object, however different in itself, and thus precludes all variety. But they have attempted to apply a remedy which cannot succeed alone, and, by endeavouring to run away from themselves, have only proved that Horace's observation is as true with respect to folly, as to conscience: *cœlum non animus mutant qui trans mare currant*.

But others again, sir, having, as it would seem, discovered that the original source of this misfortune is the possession of wealth, magnanimously, as it might be supposed, take the most effectual mode of relief, by removing the cause at the gaming-table with philosophic fortitude. Some persons, I am sensible, will be apt to deny this, saying, that fortitude is quite out of the question, and that gamesters have recourse to the faro-table, &c. for the sake of pleasure. But I will prove the fallacy of this doctrine in a moment. In the first place, it is a *prejudice*: a proof of which, according to the logic of modern philosophy, would alone suffice. However, for the sake of your reasoners of the last age, who require conviction, I will refer them for that to the gaming-table itself. Let them look at the thin, agitated countenances of the players, torn by every gust of passion; even female beauty distorted into deformity. A great man, sir, who honours me with his friendship, and who holds the office of footman (gentleman I should say) in a great house, once introduced me to see the family and their friends, with pious zeal, exerting every nerve to extricate themselves from the distresses of wealth, by the use of that sovereign alterative the dice-box and cards. I was, I assure you, highly edified at the sight, though I much regretted the dire necessity of so violent a re-

312 *Plan for Bettering the Condition of the Rich.*

medy. The company was rather of a *mixed* sort, and their pursuit was obviously not pleasure, as even successes produced only malicious triumph and additional anxiety. At the sight of one card, I saw a French valet in disguise, two colonels, an attorney and a dutchefs laugh—but it was in Shylock's tone ;—while, on the other hand, an atheist, in his anguish, forgot philosophy, and called on God ; and a quaker, a Yorkshire baronet, and a beauty of eighteen, fell to blaspheming. This scene, I naturally concluded, was not the pursuit of pleasure, but a philosophic submission to torment, for the sake of the ultimate advantages that it would produce, by easing the sufferers of their wealth. Would it not seem that this disease was somewhat of the nature of *possession* by an infernal inmate, which continually goaded the unhappy patients on to acts of repeated desperation ? What heart can be so obdurate as not to sympathize with these miserable sufferers ?

Now, sir, let me ask you and your readers, what must be the horrors of listlessness incident to riches, for which such torture is the remedy ! What objects of pity and charitable relief the sufferers ! How delicious to the children of humanity the task of relieving them !

I ought not, however, to omit the objections urged against a plan for relieving the wealthy sufferers under this misfortune, that was suggested at our last meeting at the office of the society in Threadneedle-street, by a very respectable member. He said, that the rich were so sensible of the miseries attending their situation, that, without assistance from the charitable, they seemed very well able to relieve themselves by quan-

dering their money in a thousand other ways as well as at the faro-table; and that, very fortunately, at the present time our rulers seemed to have taken their case into consideration, and were so benevolently disposed towards them, that they had humanely resolved powerfully to assist them, by way of taxation, in attaining the same end.

Most of the society were struck with the justness of the observation, and one member passed, on this account, a high eulogium on the present premier; but, on the suggestion of another, it was unanimously agreed, that most ministers were equally benevolent, and we therefore voted the premier for the time being perpetual patron of the society. But, had it not been from the fear of being taken up as a club of jacobins, I am convinced, that Bonaparte would have obtained precedence even over him; for, from what I have learnt of the sentiments of the members when consulted individually, I think a great majority would have voted for him, as the most efficacious physician in modern times for eradicating this disease: but let this be *entre nous*; for, you know, it is dangerous at present to say any thing in praise of the first consul of France. However, fortunately for the justice of the case, Mr. Theophilus Farthing, an eminent pauper then presiding at our debate, left the chair, and observed that the rich, according to their present method of proceeding, though they took the best measures to extricate *themselves* from the incumbrance of wealth, yet did not remedy the *general* evil; for that they only transferred it into other hands; and that, while the present generation of the wealthy were growing poor, their hair-dressers, cooks, grooms, milliners, inn-

314 *Plan for Bettering the Condition of the Rich.*

keepers, &c. &c. were growing rich, and would probably, in one generation more, supply the nation with senators and bucks, dutchesses and demireps; that, like the plague, though the infection left one part, yet it spread more rapidly in another; and, therefore, that some more adequate remedy must be discovered. It is true, there were some who hinted that Mr. Theophilus Farthing was one of the leading men in the begging line, consequently a very rich man, and that he was extremely anxious to preserve his riches; but the majority, sir, treated this as slander, and perfectly coincided in the sentiments that had fallen from the chair.

But I fear, sir, I have too long intruded on your patience; I will therefore conclude, hoping that the generous public will take the case of these unhappy sufferers into their consideration, and afford them that relief of which they stand so much in need. I have the honour to be, &c.

CLEMENT BIRCH, Sec.

For Dr. Anderson.

SIR,

Strand, December 9, 1800.

A FEW months since I wrote you a method of preparing potatoes as a food for cattle, and mentioned that I could inform you of what would be a substitute for wheat flour; but deferred doing so, hoping the then growing crops of grain would have prevented any occasion for it; but as unfortunately that is not the case, I beg leave to recommend the following mixture.

To two bushels or parts of wheat, add one bushel of rice, and one bushel of best beans, prepared as for the West In-

the trade ; that is, kiln-dried, shelled, split, and cleaned from the husk ; mix the articles, and have them ground small and drest fine ; they will then make good-coloured nutritive bread, and be more pleasing to the taste than a great part of what is made at present from foreign wheat.

By inserting the above in your valuable publication, it may at this awful period be of service to society ; and if so, it will be a sincere pleasure to your most obedient servant,

BENEVOLUS.

Index Indicatorius.

THE Editor feels himself under great obligations to *H. G. H.* for his many kind and interesting communications, and will always take a particular pleasure in doing every thing to forward his views.

Many of the readers of this work will be well pleased to learn, from the authority of this correspondent, that the breed of Spanish sheep, introduced some years ago into this country by the King, have given so much satisfaction to those who have been able to get any of them, that all the rams that can be produced for at least two years to come are already bespoken. The pamphlet of Dr. Parry will, no doubt, have the effect of accelerating the progress of this valuable breed. Is it not astonishing, that mankind should have satisfied themselves with disputing for centuries past, and denying the possibility of rearing these sheep, and preserving them from degenerating in this country, without ever attempting to bring the fact to the fair test of experiment ? The Angora goat has been reared in Sweden for more than thirty years past, and has been found to preserve its distinctive peculiarities. Who

316 *Index Indicatorius.—Selecting Sheep.*

will be the first to introduce the musk cow and bull, or the Yak of Tartary into this country, not for the purpose of idle curiosity, but of propagating the breed with a view to profit, till the experiment can be fairly tried on a sufficiently extensive scale? The small cow and bull (Tom breed) from the coast of Africa, could be brought over at a very trifling expence; and the Jamaica sheep is highly deserving of particular attention.

This correspondent is respectfully informed, that the offer made by the Editor to lend his aid to facilitate the introduction of selected sheep from Spain could not suit the views of a single individual, because it must necessarily be attended with considerable expence; not on account of the first price, but of the precautions that would be indispensably necessary to insure a proper selection of the best individuals there. Of this he will judge from attending to the following particulars: it is not to be supposed, that any inhabitant of those countries could be entrusted with the charge of making that selection, because, having never been accustomed to attend to the particular of carcase, &c. as of any moment, as we do, it is not likely that he would know what kind would correspond with our views, and might send the worst instead of the best. The way that appears to be the best, then, is to have a person of skill sent from this country for that purpose, who, proceeding through Portugal, might make an excursion, as if for pleasure or curiosity, during the summer months, among the mountains where the sheep then are, accompanied by a confidential Spaniard as a companion and interpreter. Having viewed the respective flocks, and thus ascer-

tained which of them had the best fleeces, considered as to fineness, closeness, and equality, let him give his companion as accurate ideas as he can convey to his mind of the kind of shape, and other circumstances, that he judged to be the best. This done, let them leave that place, the Spaniard having concerted to return by himself, and buy the number of lambs of that year agreed upon between them, which number should considerably exceed that which it was intended should be brought home. These lambs, being introduced into Portugal, ought to be divided first into two sorts, viz. those that were to be wholly rejected, and those that were deemed worthy of being sent. These should be once more sorted into two classes, inferior and superior. The best of these again sorted, and so on, till you came to the very best in the whole flock; and, being all properly marked, they should be carried down towards Oporto about the month of August, to wait an opportunity of being shipped. These should be then put on board of vessels in pairs, one, two, or three at a time, as opportunities offered, taking care never to send the whole of the best sort in any one vessel, to guard against an accidental total loss of them. In this way might be sent over as many as the funds could accomplish, without noise or fracas, if the man entrusted were cautious and prudent. They should be put on board as Portuguese sheep for live stores.

From this detail it is plain, that the funds must be considerable, and that nothing can be done in it while the war continues. Exclusive of the salary of the selector, the expence would be inconsiderable until they were put on board.

It may not be improper here to take notice, that I

saw a few days ago, in the possession of a person who lives in Middle Row, Holborn, fronting the end of Gray's Inn Lane, a ewe of the Cape breed of sheep, that carried a fleece of very fine soft wool, and perfectly free from *kemps*, except on a particular part of the buttock; a very pretty looking animal in all respects. I have seen many of that breed of sheep before; but never saw one with wool nearly of so fine a quality or so unmixed as this. From hence I conclude, that there are at the Cape various breeds of this race of sheep. Indeed this is evidently proved by the ram that is to be sold along with her, which is plainly a distinct breed, having coarse open hairy wool, and being in many other respects different from her.

A very respectable and much esteemed correspondent from Manchester writes thus: "I wish that your excellent hints in Number XX. on the subject of heavy waggons may meet with the attention they merit; and your observations in the same Number, on the effects of the introduction of manufactures into a country, entirely coincide with my own remarks. There is not now in this neighbourhood one field in tillage where, within my memory, there were twenty. The production of milk and butter for the supply of large towns, brings in a regular *weekly return* of cash to the farmers, which they like; and the abominable consumption of butter for tea amongst the poor people is productive of a great deal of evil. The meanest families drink tea twice a day, with toast and butter, or muffins; and an amazing loss of time is the natural effect of this extravagant meal. Formerly, a good wholesome diet was provided for the *whole* family, consisting of water porridge (a hasty pudding made from oat-

meal) sweetened with a little treacle, and eaten with buttermilk. Upon this I myself sup twice a week ; but it is wholly laid aside among those to whom such a substantial and economical dish ought to be an object of importance. Wherever tea is used, the children are badly fed, as no good dish is provided for them, while their mother is junketting for at least an hour with her feet within the fender over her " comfortable cup of tea" with white sugar and all the other appurtenances.

Notice to the Readers of this Work.

THE Readers of this work cannot have failed to remark, that the stationer has been very faithful in the discharge of his duty during the present volume, as the paper has been uniformly of an equally good quality ; so that one difficulty is overcome. If the same thing could be said of all those engaged in this undertaking, it would go on more pleasantly for all parties ; but, in spite of every possible effort on the part of the Editor, he finds that, owing to circumstances which he cannot perhaps appreciate, the delays have been such as to render accuracy in printing impossible, which, in regard to the sheets wherein plates are inserted, it must be owned, is usually occasioned by the engraver. In consequence of this, the sheets are sometimes put to the press without being ever seen by the Editor, and sometimes in such haste as not to allow time to make the corrections that have been marked. Owing to these circumstances, many and very striking errors have taken place in some late Numbers, particularly in the last, of which the Errata on the cover exhibit but too full a proof.

Being assured, however, that these things will still be remedied, the Editor, in compliance with the repeated request of many of his correspondents, has resolved not to discontinue the work, as he once intended, at the end of the present volume. But, as he intends to make some slight alterations in his plan, he will adhere to his determination of concluding, as well as he can, all the subjects already begun. And, in order that such readers as shall not choose to continue may be accommodated, he will bring the work there to a sort of close, by giving, with the last number of this volume, a general index to the four

volumes, beside the particular index to that volume. These four volumes will be afterwards sold as a distinct work to those who shall choose it, under the denomination of *PART FIRST* of these Recreations. The same plan will be adopted in the future publication, a break being made at every moderate series of volumes, in which the subjects begun can be conveniently brought to a close, forming *PART SECOND*, *THIRD*, and so on. On this plan, he thinks, the public will be much better accommodated than if it were continued without any breaks, because those who may wish to be possessed of any particular series of essays that suit their taste may be enabled to obtain them without being put to the heavy expence of purchasing a great many volumes which they might not want. Each of these divisions will have its own general index, as well as particular indices to each respective volume.

In return for the increasing sale of his book, and the obliging indulgence of his readers, rather than on account of a trivial fall in the price of paper, it is the Editor's intention to give an additional half sheet to each number after the present volume without any rise of price; which he will be enabled to do if the work continues to sell. It is his wish, as far as lies in his power, to make its value correspond in some degree with the demand; for pecuniary motives, farther than indemnification for expence, and moderate remuneration for time and trouble, are not, nor ever were in his contemplation.

But as he has some intention of making an excursion into the country in the beginning of summer, partly for the sake of health and useful recreation, but chiefly for obtaining authentic information respecting some branches of agriculture and rural economy, it is not impossible but he may find it necessary to discontinue the publication during his absence, should he not find a person on whom he could rely upon that occasion; but should this take place, he will give farther notice of it in due time.

He wishes it were in his power to say any thing satisfactory concerning plates: but he has been so repeatedly disappointed in that article, that he thinks it but fair to say, that he cannot undertake to get those he could wish; nor does he see it likely that it can be done in future. This he wishes could have been otherwise, but unless they could be procured in time, so as to be better worked off than they hitherto have been, it can be no great subject of regret. - Where these cannot be had, and illustrations cannot be dispensed with, he must have recourse occasionally to copper-plates; but this he will do as seldom as possible.

He most sincerely offers compliments of the season, and wishes for health and better times to all his readers.

23.

JANUARY 1801.

RECREATIONS

IN

AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 5. VOL. IV.

AGRICULTURE.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, particularly with a view to a proposal for instituting a national experimental farm.

[Continued from page 171.]

OF THE VARIETIES OF THE ASS TRIBE, AND
HYBRID ANIMALS.

THE effects of custom, prejudice, and inattention, are in no instance more powerfully evinced, than in what respects this domestic animal. It has been known from the earliest antiquity in every civilized

VOL. IV.

Y

nation on the globe ; but nothing can be less uniform than the degree of estimation in which it has been held in different parts of the world, and at different times. The ass is often mentioned in Scripture in terms of the highest eulogy. Its spirit, and, what appears to us more extraordinary, its swiftness, are represented as exceeding those of almost any other known animal. That it was used in Palestine and other eastern countries for the saddle more generally than any other creature, even by persons of the first distinction, appears from innumerable passages in the miscellaneous parts of the Bible and other ancient writers ; and that it was held in a very high degree of estimation among the Romans is also obvious, among other particulars, from the great-sums of money that were sometimes paid for asses, when compared with the prices of other animals. Pliny mentions a jack-ass that was bought for a stallion at the price of 3,229l. 3s. 4d. ; and says, that in Celtiberia, a province of Spain, a she-ass has brought colts to the value of the same sum : and Varro speaks of an ass that was sold in his own time in Rome for 484l. 7s. 6d. Plutarch, in the life of Valerius Poplicola, takes notice, that the price of a sheep was about ten oboli, or very near thirteen pence sterling, and that of an ox about ten times that sum, or ten shillings and ten-pence. Cattle, it is known, were the only beasts of draught employed in rural affairs ; and horses seem to have been very little employed, except for military purposes. The ass, and its progeny, the mule, were chiefly used for the road.

From the notices that incidentally occur in the course of reading, it would have seemed natural to in-

fer that there must be different breeds of asses, which possess qualities extremely different the one from the other; and that, instead of forming a judgment of the whole species from the particular breed that we find in this country, and conceiving the things that are told of other breeds to be entirely fabulous, because we find that they do not accord with those that are bred here, we ought rather to have been convinced that we had fallen in with a bad breed, and that it was our duty to try to improve it by obtaining better sorts from the places where they abound. But here, as in an infinity of other cases, our judgment has been blinded by prejudice. By a preconceived notion, that all the varieties of animals were merely partial deviations from one common stock, occasioned by climate, food, and other extrinsic causes, we were diverted from that course of investigation which would naturally have led to the truth. Although we had seen that a Shetland poney, not exceeding three feet in height, might be reared in the same field with a large breed of English dray-horses, and one of the delicate and nimble Arabian breed, each of which would continue to possess its distinctive peculiarities as entire as the parents from which they sprang: although we would laugh at the man who should pretend to persuade us, that by feeding a heavy cart-horse upon dates and camel's milk, as the Arabians are said to do with their fleet and persevering coursers, we could bring them to be as clean in the limbs, as delicate in their proportions, and as light and nimble in all their movements as the blood-horse—yet, because *our* asses are feeble and dull, we think we run no risk of error in believing that the sa-

324 *On the Varieties of the Afs Kind.*

cred writers must be under some fascinating influence, when they represent the wild afs as one of the most sprightly and the swiftest among four-footed creatures. As justly might we have concluded, if we had never seen another breed of horses in this island than the snail-like weighty dray-horse, that it was impossible that any of that species of animals could exist, that were capable of transporting a man upon his back the distance of a mile in the space of three or four minutes without being hurt in the smallest degree by that exertion.

From these considerations I see no more reason to doubt that there was once a breed of afses existing, that possessed the fine form and extreme agility of those described in the Scriptures, but which never seem to have made their way into Europe, than we should have had reason to doubt of the existence of the Arabian breed of horses, had they been mentioned only by a few persons who had seen them in very remote ages, if it had so happened that they had never found their way hither. It is plain, however, that the existence of that breed did not depend upon that circumstance: nor would the reality of such a breed of creatures having once existed be disproved, should it so happen that not one of them was now to be found on the globe. No man in Scotland at this hour doubts that there once existed there a breed of small, active, and hardy horses called *Galloways*, though not one of the pure breed can perhaps now be found—nor does any man above fifty years of age in that country doubt that there once was propagated there a most delicate kind of white kidney-shaped potatoe, that grew in a

manner different from any of the sorts that are now cultivated, by its bulbs descending to the depth of nearly two feet where the ground admitted of it, although he now knows well that that kind of potatoe has totally disappeared for perhaps thirty or forty years. A distinct breed of animals is much more liable to be lost than that of a vegetable of the nature here mentioned, because the animal is subject to degeneration by intermixing with other breeds, producing mongrels of an infinite diversity, though nothing of that sort can take place in regard to the potatoe as long as it shall be cultivated by slips, and not by seeds.

It seldom happens, that one error continues to prevail for a long time, without generating many more, which spring out of it almost as naturally as young animals proceed from their parents. Having found that the wild ass of the sacred writers did not resemble the European asses, we have concluded that the Zebra of the southern coasts of Africa must be the same; I do not know that it is not even contended by some, that the Zebra is the original stock from which the whole of the asinine species is derived, in the same manner as Mr. Pallas places the Argali as the parent stock of all the varieties of the sheep, and Buffon the shepherd's dog of the whole diversities of the canine species. I see no reason, however, for doubting, that there have been originally distinct varieties of the ass kind, as well as of the horse, the sheep, the ox, and every other class of animals; and that by a careful selection of these, under proper management, a *good* variety might be introduced into a country where it is not at present known, and a bad variety entirely banished from it:

326 *On the Varieties of the Ass Kind.*

and as it will be shown that much benefit might be derived from such an improvement, it becomes a duty in us to be at some pains to discover the different varieties, and ascertain as accurately as possible the peculiarities of each.

Of the wild ass of Asia, celebrated in Scripture, I meet with no hints that give any indications that it at present exists on the globe. But as every day brings to our knowledge the actual existence of particular varieties of the most common domestic animals that were not before known to exist, it is by no means impossible but such a creature may be found, and in great numbers, in some of those remote regions with which we are at present but very little acquainted: many instances of this sort have been pointed out in the foregoing volumes of these Recreations, and many more may still occur. The Yak has been reared in immense herds in the extensive regions of Tartary, in all probability for ages past; yet it was never accurately known to any European till a few years ago, when captain Turner described it in his journey to Tibet. The same thing may be said of the Tanguis horses. How many animals that have been incidentally mentioned by travellers, and never since fully described, may still exist, though the accounts of these are now in general considered as fabulous. I have already had occasion to observe, that Bernier was long deemed a fabulous writer because he had described an animal of a singular kind that he saw in the dominions of the Great Mogul, and which no other traveller after him had taken notice of for the space of more than a hundred years; yet the very identical creature has

been since found, and has been seen in England, answering in all particulars the description given of it by that instructive traveller, and under the very name (*Nil ghaw*) by which he had said it was distinguished. Leaving it then as a doubtful point, whether the wild ass of the Scripture does, or does not exist, let us proceed to those that are known still to exist in Europe.

The finest breed of asses now known is that of Spain. At this hour, as in the days of Pliny, this breed preserves its superiority: nor could I perhaps adduce a stronger proof of the influence of breed than that is. This, when compared with the insignificant breed of asses in Britain, is a large, strong, elegant, and stately animal. They are sometimes found to rise to fifteen hands high, and more; and the best of this breed sell, even in Spain, at very high prices, sometimes for a hundred guineas or upwards. As this race of creatures is hardy above all others, lives upon the coarsest fare, is patient of labour, and amazingly strong, it deserves a much greater degree of attention from the people of this country than it has ever hitherto obtained. But our taste for parade is such, that there is little probability that we shall ever turn our attention to the humble ass, which has no other plea to adduce in its favour than real usefulness and economy.

In other countries of Europe, the ass is nearly as much neglected as in Britain, and it is seldom mentioned but with slight and inattention. We cannot, therefore, have an opportunity of knowing much respecting it. Even among us, however, we see a considerable diversity both in size and shape; and though in general much inferior to the Spanish race, even the smallest of ours are large and stately animals when

328 *On the Mule, and other Hybrid Animals.*

compared with those which are found in the island of Sardinia in the Mediterranean. The Sardinian asses, in as far as I can learn, bear nearly the same relation to other asses in point of size, as the Shetland ponies to other horses, or the *Tom breed* of cattle to the medium-sized oxen of Europe. These asses are little larger than dogs, seldom rising above two feet in height, and being proportionally small in all points. They are, like the other European breeds, extremely patient, and are universally employed over the whole island for the purpose of drawing water from the wells, which they perform very well, and at a small expence. This is one other proof of the permanency of the influence of *breed* in regard to animals, which may be added to those numerous instances of it that have been already adduced in this work. The climate here differs so little from that of Spain, and the countries resemble each other so much in other particulars, that it affords a striking contrast to see the largest and the smallest breeds placed so near to each other, and under such a similarity of circumstances in all respects.

In Egypt, even at this day, the ass is represented by the French accounts of that country as a lively, spirited creature, when compared with those of Europe.

Of the Mule, and other Varieties of Hybrid Animals.

But even the largest breed of asses is inferior in size to that which men in general wish for in beasts of burden ; so that attempts have been made to raise the size by the same means that have in other cases been proved to be effectual in raising a small *variety* of any other kind of animal to a larger size, by coupling a female of the small size with a male of a larger, or

the reverse, which is found invariably to produce a progeny that is inferior in size to the largest parent, and superior to the smallest. But as even the largest asses were deemed too small, men thought of coupling some of the largest of these with some of the horse kind, which were in stature superior to them. The horse and the ass in all their conformation so much resemble each other, that it seemed probable this would produce only a mongrel breed, as takes place when different varieties of the dog kind are put together. A progeny was thus produced, it is true, which, like mongrels in general, participated in some measure of the form and external appearance of both the parents ; but it was found, that this progeny was not capable of continuing its kind, and thus it constituted a distinct order of animals, which were generally called *Hybrids* among the Greeks, and which we, having no general name, call mules. This last name, indeed, in the common acceptance, denotes only that kind of *hybrid* which is produced between the horse and the ass ; but, from the want of another term, we are obliged either to make it express both general and particular, or borrow the Greek term in its general acceptance, as I have done.

It was found, however, that this class of creatures possessed one peculiarity that has not been observed to take place in *mongrel* breeds, viz. that it had some qualities which were not known to belong in such an eminent degree to either of its parents. The duration of the life of the mule is found considerably to exceed that of either the horse or the ass. It is also less liable to disease, and capable of much more bodily exertion than either ; and, being nearly as abstemious as the

330 *On the Mule, and other Hybrid Animals.*

as, it is reckoned of much greater value than either of them, where power is wanted with economy. Fine asses, then, are chiefly valued as they may be made instrumental in the production of mules; and it is for that purpose, and the breeding of colts for the same purpose, that they are chiefly reared and improved. Both the males and the females of the best breeds are occasionally employed for the production of mules; but with a diversity of effect that I shall not think it necessary to particularize on the present occasion.

Mules, wherever the breed of asses is large enough for obtaining that species of domestic animal, of sufficient size, are universally preferred to all other animals for cheapness, durability, and general conveniency as beasts of burden. In Britain they never have been propagated to any considerable extent; and the few that have been reared here have been, in general, the produce of such diminutive-sized parents, as to exhibit only a puny race by no means calculated to conciliate the public favour: yet even here, where they have been used at all, those who employ them find them to possess the same estimable qualities that are attributed to them elsewhere. One spirited individual indeed, who deserves much praise for this and several other exertions that tend to forward the progress of agricultural industry (Mr. Eccleston of Lancashire), has been at the pains to import some fine asses from Spain for the purpose of breeding mules of a large size and fine shape; and I hope that his exertions in this line will be crowned with the desired success. But from the nature of the creature, in not propagating its own kind, and from the prejudices of the people in

On the Mule, and other Hybrid Animals. 351

general against adopting new things, it must not be expected that the progress of this improvement can be very rapid: and, unless care shall be taken to breed enough of stallions in this country from she-asses of the best sort selected with care, it is obvious that its progress must be very quickly stopped.

In Spain, where the finest mules on the face of the earth are now bred, they are in a high degree of estimation, and sell at a great price. One bad quality only has been taken notice of as being universally attached to this breed of creatures, viz. an unconquerable obstinacy in resisting ill treatment; no severe usage, it is said, can possibly induce a mule to go forward when it is not inclined to do so of its own accord; but if gentle usage be sufficient to effect this purpose, it were, perhaps, a fortunate circumstance, if all our other beasts of burden were endowed with the same kind of spirit; for, in that case, the feelings of humanity would be less frequently outraged than at present.

The valuable qualities of the mule ought naturally to have suggested the idea, that benefits might be derived from other kinds of *hybrid* animals: but I do not find that any attempt of this kind has been made, for the purpose of general utility, except one, which was apparently of a nature as little likely to succeed as any that could be attempted; that is, a breed between the ass and the cow. This class of creatures has been reared in the south of France, in Switzerland, and in Italy; it is known on this side of the Alps by the name of *Jourmarre*, and in Italy it is called *Gimarra*. It is said to be very strong, and capable of sustaining

332 *On the Mule, and other Hybrid Animals.*

great fatigue, but is in shape, and external appearance, as might be expected, much more clumsy and unsightly than the mule. Probably on account of the unpleasantness of its figure, it never seems to have been much propagated; though it has been, for some particular purposes, greatly extolled on account of its serviceableness and cheapness of keep.

No attempt has been made, that I have heard of, to obtain a hybrid progeny from any class of the deer tribe, the camel, or the goat: nor have I ever heard of an instance of a real hybrid animal of any sort being *naturally* produced, though Buffon has chosen, with that bold decisiveness which characterizes his writings, to account for some of the breeds of sheep that are found on this globe, by asserting that they are derived from a mixture of sheep and goats, merely from the circumstance of their fleece appearing to be a medium between wool and goat's hair. Thus does the spirit of system keep a perpetual tendency to lead into error, even in opposition to those laws of nature which are best established, and fully recognised by the theorist. No race of sheep has ever yet been found, that is not capable of continuing the species; nor has any class of hybrid animals been ever yet known to continue its kind.

In the agricultural account of Middlesex, mention is made of a heifer that sprung from an Alderney cow and a Buffalo, which was remarkable for yielding a great quantity of milk, and always continuing very fat without any extraordinary quantity of food. This I consider only as a *mongrel* breed; but it seems to indicate, that peculiar qualities may sometimes result

from violent crosses of this sort, that ought to cause such things to be adverted to, with a view to discover whether this be a general rule, or a particular exception.

P O S T S C R I P T.

In addition to the varieties of the goat-kind (Vol. II. p. 326) I beg leave to notice one that is mentioned by Linnæus in the account that he gives of his journey to Finland. He speaks of it as a handsome variety, of a moderate size, that had been originally brought from Peru; and as being remarkable for giving a very large quantity of milk for its size. This is another addition to the numerous proofs that we have already exhibited of the permanency of *breed*; and of the benefit that may be derived from an attention to the natural qualities of the animals that may be accidentally brought into this country.

On this subject I beg leave to state, rather more particularly than was done in p. 318, that a few days ago I saw, in the possession of a man in Holborn, London, opposite to Gray's Inn Lane, who styles himself *aviarian* to his Majesty, a ewe and ram of the broad-tailed kind of sheep usually called *Cape sheep*, which were evidently, from the nature of their wool, and other circumstances, of two distinct breeds of that variety of the sheep kind; and as I have seen others that differed from both these in several respects, I conclude that there must be there a considerable diversity of these breeds:

The ewe was a fine clean-made healthy-looking creature, hornless; the face white; the under part of

334 *On the Varieties of the Cape Sheep.*

the legs a glossy brown (I never saw another breed with coloured legs in which the face did not participate of the same colour). The wool over the whole body of a pure white, gently curled, very soft and fine, and more uniform in its quality than is common among the ordinary breeds of sheep in this country, except on the outer parts of the buttock, descending down towards the thigh; but towards the tail the wool was as fine as elsewhere. I discovered no kemps among the wool, unless it was on the part of the buttock above mentioned, which was distinguishable rather by a distinct line of demarcation, than by a gradation of shade. I am satisfied, that this sheep, on account of the quality of its wool, is a very proper object for experiment.

The ram is a coarse-looking animal; has horns; his legs covered with longish wool down to the hoof. The wool over his whole body open, long, and coarse, more resembling goat's hair than wool; exactly such wool as that which obtained the name of *Cornish hair*; so that I should account that breed as of no value. The owner, for obvious reasons, insisted that they were in all respects the same. The price demanded for the pair is twenty guineas. I mention it here, that such as are curious in wool may have an opportunity of satisfying themselves respecting it. I have seen but very little wool finer and softer than that of the ewe. She is not of a large size.

An easy Method of forcing Early Potatoes.

AGREEABLY to the intimation in my last, I shall here submit to the reader an account of some peculiarities

ties respecting the growth of the potatoe, which, though not now published for the first time, are not generally known.

Being desirous to have some potatoes pretty early in the season, I caused a bed of new horse-dung to be made up in the month of February, in the way that is usually practised for bringing forward cucumbers or early annuals. Upon the surface of this bed was spread about the depth of an inch of common mould; and when it had attained a due degree of temperature, potatoes were planted upon the surface of the mould all over the bed, close beside one another, like eggs in a hen's nest, and then covered with mould to the depth of about six inches. In this state, without glases, or covering of any sort, except a little loose straw for about ten days at first, the bed was allowed to remain, till some of the stems of the potatoes were observed coming through the mould at top, when it was judged proper to transplant them into the field where they were to remain and perfect their crop;—a mode of forcing potatoes very common in this country.

On beginning to take up these potatoes for the purpose of being transplanted, I had occasion to remark a phenomenon that was new to me. A great number of young potatoes were found sticking in clusters round the parent bulbs, by a mode of generation seemingly very different from any thing I had ever known to take place with regard to that plant. You may probably have remarked, that when potatoes are reared in the usual way, from bulbs planted for seed, the stem first sprouts out at the eyes. From the bottom of this stem roots spring forth, which increase in size as the plant

advances in growth, by which roots the plant absorbs its nourishment. A considerable time after the plant has begun to vegetate, another set of fibres begin to spring out from the bottom of the stem also. These are at first of a whitish colour, transparent, and do not divaricate at the points like the real roots, and spread to a less or greater distance according to the kind of potatoe employed. On this set of fibres the potatoes are always produced, appearing at first like small knots, which gradually increase in size, and assume their proper form, each potatoe adhering to these fibres by a particular kind of eye, which, in those potatoes that assume a long shape, is usually placed at one end, which, for the most part, is thicker than the other. This set of fibres, from the analogy they bear to the umbilical cord in animals, I would denominate *umbilical* fibres, and the eye by which the potatoe adheres to them, may also be distinguished by the name of the *umbilical* eye.

In the particular case, however, that I now describe, this economy of the plant seems to be altered and deranged. Instead of the stem and the roots being the earliest productions, the young bulbs themselves first appear; and these, for the most part, adhere so closely to the parent bulb, as to appear like warts or excrescences upon itself; but upon a nearer investigation, it appears, that they always adhere to the potatoe by means of a small fibre that springs out from it. I have seen some of these fibres two or three inches in length, and by that means was enabled to observe the mode of vegetation followed in this case, which was thus :

The fibres producing these bulbs spring out from the eye of the potatoe, and adhere to the parent bulb, exactly in the same manner as the stem usually does; in other words, that fibre is a stem. From the bottom of that fibre or stem, where it adheres to the potatoe, a set of roots spring out exactly in the same manner as in the ordinary progress of vegetation; but instead of spiring up *as a small stem*, it assumes a bulbous shape, in every respect resembling a potatoe in its form, in its eyes, and other particulars. This young potatoe continues to increase in size for some time; but at length it begins to push out sprouts, which resemble the young stems of an ordinary potatoe, and which, if suffered to remain, become stems in every respect the same as if the potatoe had vegetated in the usual way; at the bottom of which parent stems only, at the place where they issue from the parent bulb, and not where they rise from the young potatoe, spring forth roots, properly so called, and umbilical fibres, bearing their fruit precisely in the same way as if none of the bulbs above described had been produced.

I am inclined to believe, that the young bulb has always attained its full size before the stem begins to appear; but this I cannot positively say. It is, however, very certain, that it does not increase in size after the stem has pushed out above ground; but from that period remains unaltered, seemingly a mere useless excrescence.

It deserves to be farther remarked, that though the stem *itself*, when it springs out from this kind of bulb, exactly resembles that of a potatoe, yet the way in

which it rises from the bulb itself, appears to be very different from that which springs from an ordinary potatoe planted for seed. In the last case, it has been already said, the stem always springs from an eye, and roots very soon appear at the bottom of the stem, both stem and roots being very easily separable from the potatoe, without any violent fracture. In the other case, the stem seems to push out from the substance of the potatoe itself, in the same manner that the stem of a turnip when it spires into seed, rises from the bulb; and when broken off, makes a violent fracture: nor do any roots spring out from that part of the stem which rises out of this new sort of bulb, the roots being all produced at the place where the original stem sprung out from the parent potatoe. In short, this bulb appears to be nothing else, in the advanced state of vegetation of the plant, but an excrescence on the stem.

These excrescences, however, if separated from the plant in due time, have the appearance, the taste, and apparently every other quality of young potatoes; and as they sometimes attain to a considerable size, there is no doubt but young potatoes may be thus reared for the table, at a much more early period than can otherwise be had, and at a much smaller expence.—At the time I transplanted my potatoes, which was from the 5th till the 15th of May, I gathered a considerable quantity of these young potatoes (some of which were of such a size as to weigh more than three ounces avoirdupois), which I sent to my friends, as presents of great curiosity. Those that were too small for use, I

allowed to be planted with the parent bulb ; the large ones were separated, and the old bulbs from which they had been taken were planted with the others, and made as good seed as if they had not been touched.— All of them produced a very good crop of early potatoes in the open ground, which were ready much sooner than those that were not forced.

I did not at the time think of separating these small bulbs from the parent bulb for the purpose of being planted as distinct plants ; nor did I cut the potatoes, nor separate from them the supernumerary shoots that had sprung from them ; but this might certainly be done without injuring their vegetative powers, probably without much retarding their progress, and possibly without much affecting the produce. It is, therefore, a proper object for experiment.

Not having found it an object of much importance to me to rear more early potatoes, I did not repeat the experiment, and of course have not had an opportunity of remarking the circumstances that tended to augment or diminish the produce of this kind of crop. In general, it appeared probable to me, that the phenomenon might be produced by the cold above checking the vegetation occasioned by the heat below. But whether this is the case, or what are the precise degrees of cold or heat that are useful or hurtful, I had no opportunity of ascertaining. No *severe* frosts occurred while the potatoes were in the bed ; or I should have thought it necessary to have covered them up with straw.

One circumstance occurred in this experiment, that ought not to be overlooked. It chanced that some of the potatoes that were planted on the hotbed were cut,

though the greater part of them were whole. Most of the cut potatoes were entirely rotted by the heat of the bed, while very few of the whole ones were hurt in the smallest degree. The potatoes planted were also, in general, of the size of a hen's egg, or upwards.

As the practice of *forcing* potatoes, somewhat after the manner above described, has been long followed about London and other large cities, I am persuaded the phenomena above noticed, must have occurred to many persons before I observed it; but I never heard the least hint of any thing of the sort.

I beg leave farther to remark, that the *kind* of potatoes I employed in the experiment above recorded, was a large round early potatoe, of a dirty whitish colour, known in this neighbourhood (Edinburgh) by the name of *manuel* potatoe. I think it necessary to specify this circumstance, because I am well aware that different kinds of potatoes possess qualities extremely different from each other; so that it is very possible, the same phenomena might not occur with another kind of potatoe. I have heard of another kind of potatoe, which put out roots from every joint of the stem when it was laid down and covered with earth, and thus yielded a great crop: but though I have several times tried the experiment with a variety of kinds, I have never met with one that possessed that quality. In matters of this sort, it is impossible for an experimenter to speak with too much caution or precision. I have met with it since the above was written.

The figures in the annexed engraving will serve to give a clearer idea of this peculiarity in the economy of the potatoe, than can be conveyed by words alone.

Explanation of the Figures on the Plate,

Figure 1. represents a parent potatoe, with three young ones, produced in the manner above described, adhering to it. In this case, the stems by which the young bulbs adhere to the parent stock, are so short as not to appear. Some of the roots which spring out at the place where the stem springs from the parent bulb, have already shot out to a considerable length.

Figure 2. represents another old potatoe, with a cluster of young ones, of a small size, adhering to it. In this example, the stems have advanced so far, as to have been nearly penetrating the surface of the earth.

Figure 3. represents another potatoe, with a young bulb and a stem produced from it, considerably advanced above ground. In this case, all the parts are distinctly seen, and this peculiarity in vegetation is completely developed.

A represents the stem springing out as usual, from an eye in the parent bulb, with roots spreading out from it in abundance. All these roots are merely absorbents, none of the umbilical fibres having yet made their appearance.

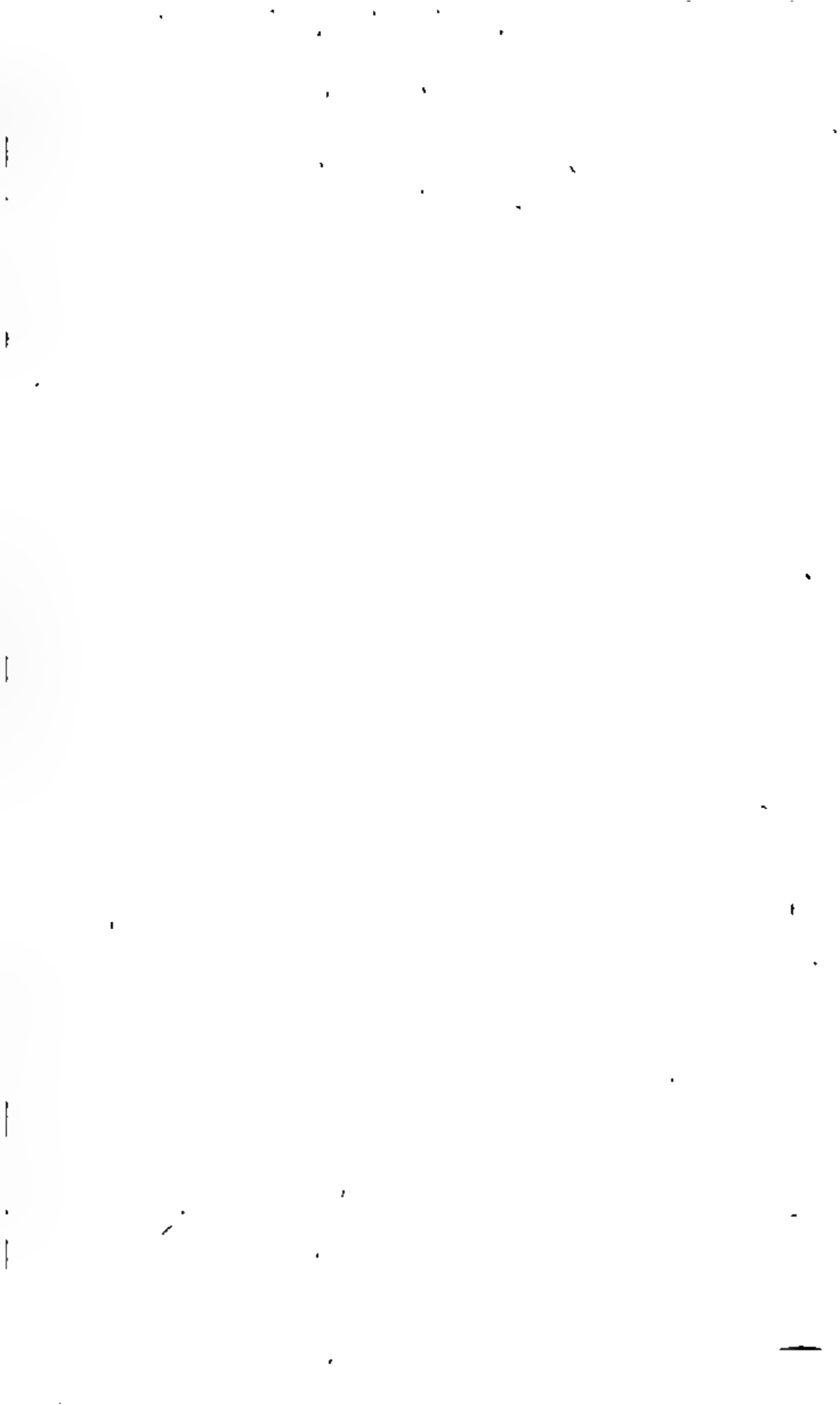
At a small distance from the potatoe, a bulb is formed upon this stem, which, before the upper stem sprung out from it, resembled the young potatoe in figure 1st.

At C, a new stem has sprung out from an eye in the young potatoe; but here we discover no roots similar to those which are always to be found at the bottom of the stem, where it springs from the original potatoe.

B and D represent eyes in this little potatoe, with the germ of young stem buds peeping out from them, which, as is usual in every kind of potatoe, are checked in their growth by the luxuriance of the principal stem.

On another part of this parent potatoe, are seen two other young potatoes adhering to it; in one of which, at F, the stem is beginning to advance,—At E, are the germs of stems not so far advanced.

I observed an appearance somewhat similar to the above on many of the potatoes last season (1800); those, in particular, which were pretty far advanced, and had nearly completed their growth before the rainy weather began. If the stalks were not quite withered, they assumed a new growth, and the bulbs below ground pushed out many excrescences around them, which swelled to a considerable size, and had the appearance of young potatoes clustering round the parent bulb, very much like those which I have just described. But the excrescences of last season differed from the former, so far as I could remark, in regard to two particulars, viz. first, I did not in any one instance observe that these last were attached to the parent bulb by any kind of stem, but were united to it rather like the accumulation of a kind of gum from a wounded tree, or like a wart from an animal, than like any common progress of vegetation, as the former was; and, second, the bumps which were forced out last season were invariably of a watery consistence and very inferior quality, which the former did not appear to be.



NATURAL HISTORY.

ON THE TRANSFORMATION, &c. OF INSECTS.

[Continued from page 269.]

The Burial of the Mole.

THE following memoir, originally composed in Latin by Mr. Gleditch, an author well known to the lovers of natural history, having never, I think, been before translated into English, I conceive that on that account, as well as from its intrinsic merit; in bringing to light in a very pleasing way the manners of one species of insects, it will prove highly acceptable to my readers.

After an introduction containing an apology for treating a subject of such seemingly small importance as the burial of the mole, our author proceeds thus :

“ I cannot persuade myself at least, that any person will seriously believe that *the burial of the mole* is a waking dream that I have had, or that this little animal, the object of the hatred of others, has performed any particular service to me that I wish to acknowledge ; or, in fine, that the whole of it is only a *jeu d'esprit*, grounded on some fancied qualities with a view to divert myself. Far from me be such projects : the mole is not such an amiable animal, nor so useful, as to be treated with such distinction : she and hers do too much mischief in our gardens, fields, and meadows, to be entitled to such an honour. We ought rather to rank them among our principal enemies, among the chief destroyers of our goods ; and it is because of this that a general sentence of death has been pro-

nounced against them for many ages past, that whoever can seize them shall kill them without mercy. Should I go then ridiculously to erect a monument to such an animal?

“It might be possible, I acknowledge, to allege to me on this occasion the example of some delicate ladies, of minds as weak as their frail bodies, who run into such extravagances. Hypochondriac or hysterical affections making them seek solitude, they endeavour to mitigate it by multiplying around them, dogs, cats, sparrows, pigeons, linnets, canary-birds, parrots, and other animals—(to these they sometimes attribute a degree of intelligence more than human)—and to whom such company appear a thousand times more engaging, or at least more supportable, than that of the most sensible persons in the universe.

“If it should happen that these dear creatures, so tenderly beloved, should die, either from a surfeit contracted by eating too much of that delicate food so carefully provided for them, or from the bad air they respire in the apartment of the miserable sufferer who caresses them, the lamentations for such an insupportable loss are almost endless. The folly of such persons goes so far, I am ashamed to say it, that they render to these brutes funeral duties, which the body of a hero who had died in the field of honour would not obtain. They wrap up these dogs, cats, parrots defunct, in the most precious stuffs, make them repose on cushions of down, in a word, bury them in due form; and, that nothing may be wanting to their obsequies, the most faithful of their servants are charged to give them an honourable convoy. The chisels even of the first artists are sometimes employed to perpetuate their memory in marble.

“ It is not in the rank of these strange and ridiculous sepultures that that of the mole must be placed, of which I am now about to speak. This concerns a fact which deserves to hold its rank in the *economy of nature*, and which happens always at certain times of the year, at least if no particular obstacle deranges it, in opposing the order, otherwise invariable, of physical causes. This fact might have been unknown to me even at this hour, and, in as far as I can perceive, to all the curious observers of nature ; for writers in natural history have preserved a profound silence respecting it ; at least, none of them have given any account of it with the necessary exactitude,

“ The first circumstance that occasioned me to direct my views to that object, was a letter by *M. Lange*, pastor in the village of *Carteree*, in the circle of Havel, written two years ago to the Academy, wherein he describes the thing such as he had observed it, and recommends it as a fit object for farther examination. I have, in consequence of that, tried to discover at different times, why it should happen, that moles, which by some accident had been carelessly left on the ground after they were dead, quickly disappeared, and seemed to escape from the hands of those who had a design to seize them. The experiments which I am about to report will clearly discover what becomes of these moles, and whether they are buried by other animals, or interred in due form.

“ It would be, in my opinion, superfluous here to establish by a long chain of arguments the nature and the certainty of that order, which is common to all the kingdoms into which all the orders of beings in this

world are divided, and to employ a great deal of time to explain how the conservation of all the living creatures that nature produces, depends, by an eternal and immutable law, upon the death and destruction of creatures who have already lived before them. There is no one thing concerning which experience deposes with more certain evidence; and it is easy for reason to discover the causes and the motives. Neither are we ignorant, that men in all nations bury under ground the bodies of their dead, either entire or in pieces, according to different usages; at least unless it be in some places where the ancient custom of burning the dead prevails, and the last honours are paid to the ashes of those who have lived.

“ Some physical observers have related, that ants also bury the bodies of their dead; but it is not yet decided whether they actually put them into the earth, or do not rather carry them out of their subterraneous habitations. It is, besides, a thing generally known, that none of the common animals bury their dead, or even touch the carcases of those of their own species, unless, it be some kinds, those especially that live upon rapine, raw flesh, and stinking garbage, who are so ferocious, as, themselves, to devour the bodies of their fellow-creatures, such as hogs, dogs, wolves, foxes, cats, &c.

“ On the contrary, the lynx, which is in the number of beasts of prey, and to whom fresh blood is a great delicacy, rejecting those carcases which have a tendency to putrefy, observes with regard to them a procedure which appears to me to deserve the attention of those who feel an interest in contemplating the cu-

riosityes of nature. After this artful and cruel ravage of the woods has killed a doe, goat, or other such prey, and has sucked its blood, it strips off immediately from some of the neighbouring shrubs as many leaves as are sufficient to cover the body of the beast it has killed, and, having thus concealed it among the leaves, quits it. After this it leaves that part of the wood as quickly as it can, and does not return to it till a long time has elapsed. This manner of covering or concealing the body, which resembles sepulture in some sort, is called by the German hunters *das verbroschen des luchs*, and the term of art appropriated to express this action is *der luchs das Wildbret verbroschen*.

“ I do not stop here to relate what the *ichneumons* and some other insects do, who after having killed spiders, caterpillars, &c. sink them in the earth, there to deposit their eggs; I will only remark beforehand, that the burial of the mole bears some sort of relation to this last procedure. I refer those to the records of natural history who have a desire to be informed of a greater number of facts of the same kind.

“ To return then to the mole: my design is not to give a description of that animal, nor to relate the means she employs for her subsistence and propagation; I shall confine myself to some circumstances that have a more direct relation to the end which I propose in this memoir. The mole, it is well known, makes her ordinary abode under ground; and it is incontestable that she there finds her food. She is seldom seen above ground, especially during the day-time, unless it be sometimes in the spring, when the water, filling her habitation, forces her to leave it, and

to seek refuge for some time in the hollow of a tree, or under thick brushwood ; or sometimes she leaves it altogether, and forms a new one on that occasion. In the time of rut also, the mole sometimes appears above ground, and the male more often than the female ; when he meets with a rival near the female, he beats him away, and chases him out of the hole. The battle is sometimes so keen, that the combatants neither see nor hear any thing around them, and they are trodden under foot without trying to prevent it. Dogs, cats, and hedgehogs usually watch them on these occasions, and kill them.

“ But even when the mole does not appear above ground, she is by no means safe in her retreat from the snares of the weasel. That enemy of the mole is in truth almost the only one that she knows, but he is a dangerous one. He goes to the very bottom of her habitation to attack her ; and after having killed her, he regales himself upon her fresh carcass. I have no certain proofs that the weasel draws the body of the mole from below ground ; but I have seen him sometimes do so with the hedgehog. There are few animals to whom the mole is a tempting bait ; this however does not prevent her from being continually hunted, and exterminated without quarter ; but when she is once dead and begins to smell, which takes place very soon, neither dog nor cat will touch her, notwithstanding the ardour with which they pursue and kill her, and although from their nature they are capable of going several leagues distant in search of infected carcasses (without even excepting men) and devouring them, as is often seen on fields of battle.

“ Dogs of chase, who pursue game, furnish an example nearly similar to this ; they do not usually like to eat, either raw or roasted, several sorts of birds, especially water-fowl, but put them away, and toss them about, as if to divert themselves : and they do not, in general, touch their tainted carcases when they chance to meet with them.

“ I do not indeed know whether the fox, the raven, the owl, and different sorts of hawks, which, when hunger presses them, content themselves with frogs, crabs, and rats, could have their voracity so far excited as to eat dead and putrid moles.

“ There is no reason to be astonished, as some persons express themselves, at meeting with few, or scarcely any dead moles ; for, in the first place, the greater part of those which die naturally, remain underground, at a greater or less depth, and there putrefy imperceptibly, without being observed by us on account of the smallness of their size. There are at least as many who are destroyed by divers sorts of enemies, the greater part of which are unknown to us, who carry them off immediately into secret places. There remain only the small number that are destroyed by human industry by means of traps, or that some accident brings within the reach of dogs or cats, who, having wreaked their vengeance on them, leave their bodies above ground in our gardens, fields, or meadows.

“ It is of these last especially that we are here to take notice : thrown down by chance, scarcely do we see them upon the earth before they are observed quickly to disappear, and one naturally asks, *What is the cause of this disappearance ?* Although for the most part these

things seem to be minutiae to which few deign to pay attention, yet there are always some lovers of natural history to whom the smallest details are precious, and who allow nothing to escape that nature presents to them; these have observed, that moles, when killed and left upon the ground, disappear, some sooner, others later, but always infallibly; and that the quickness or slowness of that disappearance is occasioned by a diversity in the nature of the earth, of the season of the year, or of the temperature of the air, without, however, being able at all times to say wherefore, when, and in what manner, the moles have been carried away. I acknowledge frankly, that I rather imagined they had been carried off and devoured by some animals, than that they received a regular inhumation. I do not say that this first case does not sometimes happen, I have even been witness to it; but in the great number of experiments that I have made with this view, it has only happened three times that the moles which I had laid down upon the ground were carried away by the hedgehogs. I have then a right to say, that that case is not frequent; I add, that it may happen sooner or later, according as the season is more or less cold or moist, and according as the ordinary grave-diggers of the mole perform their functions with more or less exactness.

“ All these things being set apart, I am really convinced that the moles, of which I am about to speak, being laid down upon ground that is moderately moist, whether it be of an excellent or middling quality, will assuredly disappear in the course of three days; often even, when the weather is warm and moist, in twelve

or sixteen hours. But if they should chance to be laid above a bottom of rock or stone, upon stiff clay, or indurated till, upon places covered with moss, on wet marshy places, or where divers kinds of rushes form a thick matting of fibrous roots, upon arid soils, dry burning sands, upon any place dried up by the scorching rays of the sun, or under trees or shrubs, the interment goes on then very slowly, or not at all. After they have lain more than three days in such places, their putrid smell attracts the animals which live on carrion, who carry them off during the night, and thus prevent the interment.

“ On this subject I made a great number of experiments, a few of which only I shall state, choosing for this purpose those which will throw the clearest light on that which I have advanced, and furnish the most satisfactory proofs of it.

“ May 22d, anno 1750, a mole which had been taken before mid-day was the first subject on which I operated. I put it upon the moist soft earth of a garden, and the 24th of the same month I found it already drawn from the surface of the earth to the depth of four fingers breadth. It had kept the same situation that I had given it, and its grave corresponded exactly with the length and breadth of its body. By the 25th this grave was already half filled up. I drew out the mole cautiously, the carcass of which exhaled a horrible stench; it did not seem exteriorly to have suffered any alteration, except that its belly was very much flatted and shrunk up. Directly under the carcass I found little holes in which were four beetles (*Scarabæus morticini*), two of which were larger than the

others, which made me suspect that they were two pairs of these insects. I shall say more of them afterwards, without, however, giving their entire history, confining myself to a kind of relation.

“ Not being able at that time to discover any thing else than these four beetles, which were covered all over with small dice, I put them into the hollow, and they quickly hid themselves among the earth. I then replaced the mole as I had found it, and, having spread a little soft earth over it, left it without looking at it again for the space of six days.

“ On the 12th of June I took up the same carcass, which was then in the highest state of corruption, and all the hair fallen off. I found the belly hollowed out, and devoid of intestines; and the whole body swarmed with small, short, thick, whitish worms, to the number of 60 or 80, which gave to that corrupted mass the appearance of larded meat. These little worms, in as far as one could judge by their exterior, were the family of the beetles; but it was not easy to conceive how they had been born and grown up so quickly. Besides these worms, I found the four beetles in the hollow, and below, another, smaller one, round, of a black colour approaching to green, and very lively.

“ All these circumstances made me conjecture, that it was the large beetles who had buried the mole; and I thought myself authorized to believe that they had deposited their eggs below ground, in the body of the mole which they had interred; but it appeared necessary, in order to convert my conjectures into certainty, to make experiments under my own immediate inspec-

tion, which should prove these things in the most distinct and positive manner.

“ With this view I took away these five beetles, with about a score of their little worms, and put them in a small box filled with earth, and replaced the mole in its tomb. I then, the same day, took a glass cucurbit, which would hold about six measures of water, and more than half-filled it with moist, rich, porous earth. I put into it the five beetles, with their young. Scarcely were they placed upon this earth, when they concealed themselves in it; nor did they appear any more during that whole day. As to the worms, some of these only, viz. the largest, buried themselves also in a minute; but the others who were weaker, perhaps because the cover of the small box had pressed them too much on the earth, remained about an hour above ground in a languid state, after which they slowly disappeared. I put the cucurbit, covered with a cloth, in the cabinet in my garden; but the earth appeared to dry too much by reason of the heat.

“ On the 30th of June, after mid-day, I put the cucurbit on the surface of the open ground, and exactly in the middle of it two frogs, of a middling size, pressed one against the other, in such a manner, however, as to give room for the observations I proposed. The one lay upon its belly, and the other on its back. At the end of three hours, all the beetles, leaving the earth, traversed over the whole body of the frogs; they did not, however, then attach themselves to them, but tried to take wing, in order to make their escape from the cucurbit. At length they buried themselves in the earth, but it was wonderful to see what difficulty

they found in doing this ; the surface of the earth, being too much dried, had run together into a hard mass, which they could scarcely penetrate. Seeing this, I moistened it by shaking above it some wetted straw, that the water might fall gently upon it, and thus insinuate itself slowly and equally through the whole. I quickly perceived that this method of moistening the earth should be often repeated. Soon after the beetles re-appeared, and ran over the bodies of the frogs as before : I watched this procedure till ten o'clock, after which I could no longer observe them.

“ On the 14th of June, at four o'clock in the morning, I found one of the frogs (that which had been placed upon its back) drawn from the middle of the cucurbit towards one of its sides, and completely interred. It was covered in the same kind of tomb that I have described when speaking of the mole ; and it appeared, that a single pair of the beetles had performed this operation. The other pair was occupied about the frog that was placed on its belly, and they did nothing but run about it during the whole day, as if they were busied in measuring its circumference and dimensions. In the mean time, the small blackish beetle tried to pierce the body of the frog under the ribs, which were yet above ground ; but, as experience had taught me that the cucurbit became too hot in the house, I carried it, towards the evening, into the garden itself, in order that these insects might enjoy a freer air.

“ On the 18th of June the second frog had obtained the same kind of sepulture as the first. Being fully assured of the fact with regard to the one as well as the

other, it was easy for me to comprehend, that the same thing might happen in respect to other animals of small size; but I did not from this conceive myself to be freed from the necessity of being equally careful in making other experiments, to push this discovery as far as it could be made to go, and to observe every operation of these active and diligent grave-diggers, through the glass, in every step of this interesting procedure. I wished also to know, whether the whole, or the greater part of the small animals are liable to receive this kind of sepulture; and I had the happiness to succeed to my wish in regard to this particular...

Scarcely had the last frog been thus buried, when I took a linnet that had been dead about six hours, and which had not yet the least taint of bad smell. I placed it in the middle of the cucurbit upon its back, and in a few moments the beetles showed themselves as alert in quitting their holes as they had been with regard to the frogs. At three hours after mid-day, one pair only of the beetles were seen about the bird, which were all covered over with very small lice, especially the larger, which I suspected to be the female. Immediately after, the one and the other began their work in hollowing out the earth from under the bird. They formed a cavity the size of the bird, by pushing all around the body the earth which they removed. To succeed in these efforts, they leaned themselves strongly upon their collars, and, bending down their heads, forced out the earth around the bird like a kind of rampart. The work being finished, and the bird fallen into the trench, they covered it, and thus closed the grave, as has been several times mentioned.

“ You would often have thought that the bird moved alternately its head, its tail, its wings, or its feet. Every time that you observed any one of these movements, you might also remark the efforts that the beetles made to draw the bird into the grave which they had already nearly completed, and emptied of its earth; and, in order to succeed, they draw it by its feathers below. I saw them afterwards do exactly the same thing with all the other carcases. This operation of the two beetles had lasted full two hours; when, at last, the smaller beetle, or the male, drove away the female from the grave, and would not allow her to return, forcing her to enter her hole as often as she offered to come from it.

“ This beetle continued the work alone for several hours (on the whole, five at the least)... I was truly astonished at this continued application in such a small creature, and at the great quantity of earth which he was able to remove in that time. But my surprise was a good deal augmented when I saw this little insect, stiffening its collar, and exerting all its strength, lift up the bird, make it change its place, turn it, and adapt it in some sort to the grave that it had prepared; which in the end was so far excavated, and so spacious, that one could perceive exactly under the bird all the movements and all the actions of the beetle.

“ From time to time the beetle, coming out of its hole, mounted upon the bird, and trod it under foot; then returning to the charge, it drew the bird more and more into the earth till it was sunk to a considerable depth. Finally, the beetle, in consequence of

this uninterrupted labour, appeared to be a little tired : having leaned its head upon the earth beside the bird, it preserved that position for nearly an hour, without the smallest motion, as if to rest itself ; after which it retired completely beneath the earth.

“ On the 16th of June, early in the morning, the bird had been drawn entirely under ground to the depth of two fingers’ breadth, in the same position that it had when laid on the earth, and the trench remained open the whole day ; so that this little corpse seemed as if it were laid out upon a bier, with a small mound or rampart all round, for the purpose of covering it. Without doubt, the frogs that were below were the cause of the resistance in this part. In the evening the bird had been sunk deeper into the earth about half a finger’s breadth. This operation continued till the 18th of June, when the work had attained its final completion.

“ I did not wait, however, for this event to make new experiments : on the 17th, towards mid-day, I took a small fish, which, from the redness of its eyes, is called in German *Rothauge* (*eritrophthalmus*), and placed it near the cavity for the bird, pressing it towards that. In as far as I could conjecture, the other pair of beetles had interred, by the 19th, the whole of this little fish, and had covered it up in the ordinary manner.

“ On the 21st of June, before mid-day, I put into the cucurbit a little bird with a red tail, called in Latin *Rubicilla*, with a small dead crab : on the morrow the tomb of the bird was finished ; but it was not the same with that of the crab, the point of whose

tail only was drawn under ground. The day after that, I put into the cucurbit another red-tail that had died; and on the 25th I found that also under ground.

“ But, although the earth had been watered from time to time, it had become insensibly much firmer than at first, and there remained besides but very little space to conceal new carcases. I took away the crab, which had not been yet buried, and, having added about three fingers' breadth of fresh earth, replaced it. It ought to be remarked, however, that the shell was entirely emptied, by a little hole, which seemed to me to have been the work of the small beetle; for the larger ones had never begun to operate in any way upon it.

“ I added a pullet that I had preserved six weeks in spirits of wine; but at the end of three days I was obliged to take away both the pullet and the crab, because the beetles, instead of touching them, remained in their holes, and did not appear at all above ground while they were there. Nearly the same thing happened with regard to a mole-cricket, which I had put in the cucurbit in their place; the beetles did indeed turn it and re-turn it several times, but finally left it without sepulture; and in the space of six days, small worms, which had proceeded from eggs of the large house-fly, who had found an entry into the cucurbit, consumed the mole-cricket above ground, leaving only the solid parts of it behind.

“ I had nothing farther to desire as to the certainty of the fact that I examined; I was convinced, that the beetles, of which I have hitherto spoken, really and truly bury the carcases of all small animals, with the exception of those that are of too large a size to be ma-

nageable by them; but it did not appear probable to me, that such a great number of carcases could be destined solely for their nourishment: I hence concluded, that the small worms that I had put into the cucurbit must have come in for their share, of which I was afterwards convinced. In fact, towards the end of autumn, I found these worms, already far advanced, and of a considerable size, eat these carcases with a very good appetite; which made me believe, that in the spring following they would undergo their last metamorphosis. I observed, that they were already so strong, that when the large beetles passed near them, or touched them in the least, they attacked and bit them, and would not quit their hold as long as they could prevent it.

“ But to return to my experiments. On the 28th of June, in the morning, I threw into the cucurbit a large frog, with a green grasshopper of the largest species, and another of a smaller sort. On the morrow, towards mid-day, all their carcases were entirely buried, except the feet of the frog, which were still above ground. The same day I put another frog into the cucurbit, and by the 1st of July the beetles had performed the same duty to him.

“ On the 3d of July I varied my experiment. I took the fresh entrails of a fish called *ameia*, of a middle size, and threw them into the cucurbit; and, in as far as I could conjecture, the abundance of provisions and the want of space were the causes why the sepulture was not completed till the end of four days. On the 7th, towards evening, I made the same use of a little fish called *alburnos*; and on the morrow morn-

ing I found it concealed under the earth ; I put in the place two morsels of an ox's lungs quite fresh, one of which was buried at nine, and the other at ten o'clock.

“ I observed, that there were only three large beetles who assisted at this interment, and that one of the females was wanting ; I remarked also, that during the time of these last experiments they were extremely tormented by those small whitish lice already mentioned : they were so covered with these when they came out of the earth, that their bitings made them run here and there, as if they had been goaded by stings. Sometimes these lice fell upon the ox's lungs quite fresh and bloody, and then they left the beetles at rest, content, as it would seem, with sucking the juices from the lungs.

“ These are the experiments in which I had been employed without interruption from the 21st of May till the 10th of July, and with a continued attention. A new spectacle, furnished by terrestrial bees, called my attention elsewhere, and made me undertake a journey. But I had made a sufficient number of experiments to afford me the fullest assurance, that dead moles, and other small animals, with very few exceptions ; and the intestines, and even the flesh of larger animals, when divided into pieces of a convenient size, receive, by the ministration of beetles, that kind of sepulture of which I now treat. It results in effect from my recital, that in *fifty days* four beetles have interred twelve carcases, comprehending the first mole, viz. *four* frogs, *three* small birds, *two* grasshoppers, and *one* mole ; to which must be added the entrails of fish, and two pieces of the lungs of an ox.

“ I add to the above experiments, that from the commencement I had put some beetle-worms into a separate glass vase, the bottom of which was covered with earth, in order to observe apart their food and growth, fearing that such examination, if made in the cucurbit, might have interrupted the grown-up beetles in their operations of interment. In the month of September following, I separated from the earth the beetles, as well as the worms that they had engendered, and which had by that time become large and strong.

“ With all the necessary precautions, I poured a certain quantity of water into the glass aforesaid, and into the cucurbit, and washed the earth by little and little, which in consolidating had become very firm and tenacious. The water made the beetles immediately leave it. As to the small worms that were concealed in the little that remained of the carcasses which they had consumed, they were not all of the same size. But I cannot enough admire, that of *four* frogs, *three* small birds, and *two* fishes, there should have remained little or nothing of bones or sinews; for I found nothing in the earth but some of the large feathers, scales of the fishes, and some pieces of the heads of the birds. It was, besides, a very difficult matter to separate these remains from the earth, because they had afforded a kind of fatty matter, which the beetles had kneaded up into a mass that was very coherent and tenacious. I did not there perceive any small bones connected together, nor any parts of the skeleton, as are sometimes found in those heaps of animal matters which ants accumulate.

“ I had occasion also to discover, in the course of the same month, the cause of this latter fact: having found some beetles of the mole-interring species attached to the remains of a lamb thrown upon the dunghill, and, of which dogs, foxes, and ravens, had carried off a part, I remarked, that the beetles did not attach themselves so much to the fleshy parts of the carcass, as to the articulations, tendons, and ligaments, to the vertebræ of the spine, and the epiphyses of the bones; I saw that, having found one of the thigh bones broken, they had insinuated themselves into the opening to suck the marrow and the juices of the articulations; whence I conclude, that beetles, preferring the foresaid parts to those of a muscular nature, will naturally destroy entirely the skeletons of little animals; which accords with my observations.

“ The experiments above described do not allow a doubt to remain, that every thing passes in the sepulture of the mole as I have stated; but it still remains to be discovered, whether several beetles are required to inter one mole, or whether one alone suffices for that task, in spite of the disproportion between the size of the animal and of the insect? The following experiment will decide that question.

“ In the month of April I had killed a mole that had been caught alive, and laid it upon a plot of the garden that had been newly dunged and dug over. In the space of 22 hours the mole was half interred. I drew it from the ground with all the circumspection possible, and found it perfectly sound and entire; but, notwithstanding a diligent search, I could only find *one* of my beetles, which did not even appear to have

been a long while in the form of a beetle, and which had come from the bottom of the earth to the surface. This insect belied the observation of naturalists, who pretend, that there never are any of those whitish lice (*acaros*) found but upon old beetles: this was completely covered with them. As to the rest, I cannot positively say whether it was the sole interrers of the mole, or whether in searching I had crushed, or otherwise destroyed, or frightened away, the other; which is probable, as I had always before found at least one pair, and several times two. To ascertain this point, I carried this single beetle with the mole, and put them together into a glass cucurbit with earth, which was covered at top, as usual, with a fine linen cloth.

“ On the morrow, about seven o’clock in the morning, the beetle had already drawn the head of the mole below; and, in pushing the earth backward, had formed a pretty high rampart around it. The interment of the mole was completed by four o’clock in the afternoon. Could one have imagined, that a miserable animalcule like a beetle, without the aid or assistance of any other stronger creature, could have buried under the earth, in so short a space of time, a mole, which surpassed it at least thirty times in bulk and in weight?

“ I ought to add still one experiment to those above recorded, and to describe it in few words. I made it with a view to avoid the disappointment that I had met with from the hedgehogs carrying off the moles, as I have stated above. I took, then, on the 30th of May 1751, two dead moles, and put them after mid-day, while the sun shone very hot, in the warmest part of

my garden, on a part of the ground that was perfectly parched and dry. I tied both the one and the other of these moles, by one of the hinder feet, very firmly to wires that were fixed to small bent sticks which I thrust obliquely into the earth, so as that the moles remained suspended perpendicularly to the earth, and in such a manner as that the point of their snout just touched the ground. On the morrow, the two heads had been drawn down as far as the wires would allow them into two holes that had been dug out to receive them. Having then lowered the sticks about two fingers' breadth, I found, on the 1st of June, they were interred again as deep as the wires would permit them to go: on the 2d of June, having lengthened the wires once more, they were interred so deep as that their two hinder feet alone remained above ground; and, having taken away the wire entirely, they were altogether buried by the 5th of the same month.

“ I add, that the moles had been entirely stript of their hair (by reason of the putrid state they had attained), except the head; and that the hair, having remained at the surface of the ground by reason of the smallness of the hole which had stripped it off, the body appeared quite bare and smooth, as if it had been shaved. I need not add, that this hasty corruption was occasioned by the great heat of the weather. Whenever similar circumstances occur, then, the tomb of the mole will appear to be garnished all round with a border of hair. But when it is interred by the beetles without difficulty or delay, the hair remains for some time attached to the skin below ground; and that will be always found, after the whole of the carcass has disappeared.

“ I made one other remark. Having drawn out one of these moles from the earth, I laid it at two hand-breadths distance from the hole upon a dead serpent, which was entirely dried up. Five days afterward it had been taken from above the serpent, carried back to the same hole, and replaced in its former position, but at a greater depth. With regard to the serpent, it remained in the same place, having been too much dried.

“ While I was engaged in these experiments, one of my friends, who wished to dry a toad in the shade, fixed it to a stick which he stuck into the ground. When it began to putrefy, the beetles, allured by the smell, as usual, having loosened the end of the stick that was fixed in the earth, made it fall to the ground, and they then interred the toad and the stick together,

“ With regard to the time of the year when the beetles bury the moles and other animals, this interment begins when the weather sets in to be steadily warm, and continues generally from about the middle of April to the end of October. The particularities here enumerated make it appear that it is not indifferent to the beetles to have the carcases above or below ground; it is also apparent, that it is not for their food alone that they are so diligent in burying these carcases; the small worms there engendered indicate other views. If they wanted these carcases only for food, as they do the remains of large animals thrown away, they would consume them above ground, without taking the trouble to inhumate them, and they would do with little carcases what they do with the larger,

which they never attempt to bury, as well because of their bulk, as because the larger rapacious animals tear and carry them off piecemeal, so that two or four small beetles would neither have the time nor the strength to inter them. But as to the burial of those of a smaller size, with regard to which the preceding experiments do not admit, I should think, the smallest doubt, they are more than probably destined, as has been already insinuated, to form a proper nidus for the eggs, and to nourish the young family that springs from them : there is the greatest probability, that the large beetles would not exert themselves so much for the sepulture in question without this latter aim, or if they wanted the carcases for their subsistence alone. It was proper that this necessary step in the procreation of the species should go on under ground ; because foxes, ravens, kites, and other carnivorous creatures, devouring the bodies above ground, they would swallow the larva of the beetles along with it, and thus would the whole species run a risk of being extirpated."

MISCELLANEOUS LITERATURE.

On the comparative influence of agriculture and manufactures upon the morals and happiness of a people, and the improvement and stability of states.

[Continued from page 299.]

In the preceding parts of this discussion, I have considered the question only under its general points of view. In what follows, I shall endeavour to consider it more nearly as it respects the following particulars, viz.

Population, and a supply of provisions—

Internal tranquillity and national security—

War, revenue, and resources.

POPULATION. In regard to population, under one point of view, it would appear to be necessary to decide in favour of the manufacturing system; for wherever manufactures and external commerce are carried to a great extent, people are necessarily collected together in great crowds in particular places, where they appear to be actively employed in going about their business in great numbers like a hive of bees; so that to such persons as resort to those places of general concourse the nation seems to swarm with innumerable multitudes; and a very exaggerated idea is formed of the population of that kingdom, compared to what it could seemingly have been estimated at, if the same number of people had been dispersed over the whole country, and peaceably employed in the labours of agriculture. In this way I have no doubt, in the present day, many

men who have lived mostly in the capital, or other great cities, and have seen the numbers of people there sensibly advancing from year to year, have formed ideas of the increased population of this country far beyond the truth. Those persons, however, who have lived always in one part of the country at a distance from towns, and have formed their opinion from what they have seen take place in their own neighbourhood, will be apt to make a very different conclusion. Both these modes of estimating, then, being perhaps alike fallacious, we must have recourse to some other more certain rule of judging.

Sobriety of conduct, simplicity of manners, and that moderation of desires which is their necessary attendant, have been invariably found to promote matrimony in the highest degree in every country on the globe; because they have a necessary tendency to insure a certainty of subsistence to a family, without becoming burdensome to the parents. But wherever matrimony most prevails, and subsistence is most secure, and the income of individuals is the most equable at all times, there, it is obvious, the population, beginning with a given number, must increase much faster than where the earnings are more unequal, and liable to starts and interruptions, which, by throwing superabundance into the hands of thoughtless individuals occasionally, induces them at these times to expend with a wasteful profusion that which might have supported them well when they can earn less than formerly, had they preserved the surplus, and they are thrown into embarrassments and want; insomuch, that, although the same number of persons in the

manufacturing line should earn considerably more, *upon the whole*, than those in agricultural departments, yet the first will be much more liable to experience distress from want, and will be of course prevented from marrying; or, if they do marry, will be much less able to provide for the wants of a family, and enjoy the blessings of domestic comforts, than the quiet labourers of the fields. From this point of view, then, it is impossible to deny that the population of an agricultural people must advance much more rapidly than a manufacturing district. But this kind of balance will be greatly augmented when other considerations are taken into the account.

Wherever agriculture is the chief business of the great body of the people, they must necessarily live in detached houses or hamlets. The men, while occupied in the fields, have their minds employed about the business in which they are engaged, without being liable to be corrupted by the seductions of wicked or designing persons, or by those who have sunk into depravity of manners; while their wives, busied about the cares of a family, are under no temptation of falling into vicious practices, squandering their money in useless finery, or wasting their time in idle gossiping. In consequence of this, when the rural labourer returns to his cottage, he enters it with the prospect of finding peace, and quiet, and comfort in the bosom of his family. The little time that he has to spare before the hour of rest approaches is scarcely enough to allow him to have his wished-for share of innocent chat with his infants, which tends to cherish his love for them, and keep alive their tenderness and

reverence for him. The young ones thus grow up with love, veneration, and respect to their parents ; which being reiterated from day to day, they gradually enter upon life with the enlivening sensation of filial respect, and the exhilarating prospect of parental enjoyment along with the woman whom they have been accustomed to view with a partial tenderness from their earliest infancy : thus are they bound, as it were, by the irresistible chains of nature, to enter into the state of wedlock at an early period ; whereas the manufacturer, who has spent the best of his days in illicit pleasures, is deprived of the means of obtaining a mate of a different description from himself ; they meet together then without attachment : their interests are too often disjoined by a hundred wayward affections : disease, contracted by their irregular course of life, swallows up the means that ought to insure family comfort : the husband and wife being often together, those accidental fits of peevishness, which cross incidents too naturally produce, will sometimes occur, and they find it difficult to repress on these occasions those expressions of chagrin which are unavoidable : sharp words beget replies : the children are treated unkindly : they are witnesses to the squabbles of their parents, and lose that respect for them which is the surest band of family union : their domestic mansion becomes to them a prison, from which all parties try to make their escape as quickly as possible ; and thus the young ones throw themselves upon the world under circumstances that render it next to impossible that they should ever be able to enjoy the sweets of domestic comfort. Is it under these circumstances that

population can be expected to increase? But such are the bulk of those who fill the crowded streets of a great manufacturing and trading metropolis. Let those who think this description exaggerated, enter, as I have occasionally done, the houses of the lower classes of artisans and others in the metropolis; and if he can come out of them without feeling a sensation of distress approaching to that of horror, I shall be much deceived.

When we consider this question under another point of view, still we shall find ourselves reduced to the necessity of drawing the same conclusion. Wherever people exist, they must find subsistence; and that subsistence must in all cases be derived either from their native soil, or from foreign parts. Unless it be in very singular circumstances indeed, the principal subsistence of the inhabitants of every country must be derived from their native soil; and this is the situation that we must first consider.

In this case it is plain, that the population of no country can ever exceed the means of subsistence that it affords; which will be more or less, according to the state of society in which they live. In the earliest state of society, men invariably rely for subsistence on the animals that they can kill, and the wild fruits that they can collect; and as, in temperate climates especially, the last are little abundant, and totally wanting except at particular seasons, these can be accounted of little avail; the people must therefore subsist almost entirely upon the fruits of the chase. During this state of society the population must always be extremely small. The produce of a thousand

acres would perhaps, on an average, be required to subsist each person; nor could either manufactures or commerce that deserve the name exist there. Its means of supporting population must also diminish, instead of augmenting.

The pastoral state is the next stage in the progress of population. By thus bringing the animals always under command; they remove the necessity for ever destroying more than can be fully consumed; and by availing themselves of the milk, a great saving is produced; so that many more people can be subsisted on the same quantity of the produce of the fields. And as the quantity of native produce of the soil must vary according to its richness, the quantity of ground required for each person will vary. But in a country such as Great Britain in its natural state, taking an average of all soils, it could not, as I should imagine, be estimated higher than one person for one hundred acres.

But as population increased beyond this degree, men found themselves under the necessity of augmenting the means of subsistence by digging the ground and sowing the seeds of such plants as were known to be of a nutritive quality; and in this way it was soon found, that the ground could be made to afford a much greater proportion of human subsistence than in either of the former. Man, when he once betook himself to the cultivation of the soil, became an agriculturist; and in process of time he made discoveries that were of infinite consequence to him as an inhabitant of this globe. Instead of finding his subsistence, as before, limited to a certain extent, which it was beyond the

reach of his power to exceed, he found himself endowed with faculties that enabled him to augment the quantity of subsistence for man to an extent to which he hath never been able as yet to assign any limits. At the first, he, no doubt, conceived that it was only those spots which were naturally of the most fertile kind that could afford him abundant crops of corn; but experience taught him, that if the dung of the animals that were fed by the native produce of the soil were preserved, and laid upon those parts of the ground that were cultivated, and properly dug into it, and judiciously managed, even barren fields could be rendered productive, and not only for a time, but even for a perpetuity; for the forage that was produced by these crops enabled him to sustain more cattle, which, of course, afforded a greater quantity of manure; and this extra manure, when conjoined with others that he found in the bowels of the earth itself in inexhaustible quantities, if blended with the earth in a proper manner by labour under the guidance of skill, tended still to add more and more to the fertility of the soil the longer it was continued; so that thus he saw it was in his power to form at will, as it were, a new creation. He could not, indeed, add to the extent of his fields, but he could add to their productiveness from year to year, so as to make it keep pace with his population, whatever that might be; allowing him still to enjoy plenty to an inconceivable amount. Thus, instead of being able to furnish subsistence to one person only for each *thousand* acres, as we saw at first, he may bring it by a gradual progression to subsist one person to a *hundred* acres—one to *fifty*—one to *ten*—to *five*—

to *one* acre : nor need he stop here ; no barriers lie in his way that he may not overcome. It may still be carried forward to ~~two—three—five—ten~~ persons to each acre. It may even be pushed so far as ~~twenty~~—perhaps *fifty*. I have made a computation, from actual experiment, of the quantity of human sustenance that can be afforded by the produce of ~~one~~ acre in potatoes, and another acre in good feeding-grass land ; and I find, that it is as 230 for one ; that is, one acre in potatoes would sustain as many persons as 230 of good grass land ! Many thousands of acres of *inclosed* grass lands in England would not afford so much human food from 1000 acres as one of potatoes ; nor can any one pretend to say, that it is beyond possibility to furnish subsistence to *one hundred* people from the produce of one acre of land, which was originally in that infertile state that would have required the produce of a thousand acres to subsist one person.

Whoever contemplates this dispensation of Providence must, I think, recognise that it was the will of the Supreme Disposer of all events, when he placed man on this globe, that he should become an agriculturist. Not only shall we be satisfied of this from the authority of Holy Writ, which informs us that the *first* man was placed in the garden of Eden, and commanded “ to keep and dress it,” but from the still more authoritative command of necessity, which compels him to do it, and the power that has been conferred upon him thus to relieve himself from want universally, if he shall choose to make a proper use of those faculties which God, in his infinite mercy, hath been pleased to confer upon him. Let not man then complain of

Heaven if he suffers want at any time. The fault is his own if he shall at any time be reduced to that sad necessity, and it only requires him to exert himself in order to avoid that afflictive calamity.

But this he is not to expect will ever be done by the intervention of a miracle. The means that are adequate to that end are in his power. If he chooses to avail himself of these means, the effect is certain; if he chooses to neglect them, the consequences are not less unavoidable, and his subsistence inevitably *must* fail. The melioration of the soil must ever be proportioned to the means that are made use of to augment its productiveness; and this will ever depend upon the quantity of *labour* and manure that is judiciously bestowed upon it. I mean to say, that no permanent or general melioration to any considerable extent can ever be effected but by labour; and that, under skilful management, the degree of melioration will be proportioned to the *labour* that is bestowed upon the soil, and the attention that is paid to the proper use of manures, those especially which arise from the soil itself. In other words, the productiveness of the soil will be proportioned to the number of persons who are employed in active labour upon that soil, and the economy with which they conduct their operations. Hence it follows, that if the population of any country shall advance, and if the people in it be chiefly employed in the cultivation of that soil, its productiveness will keep pace with that population, whatever it shall be; and they will have abundance at all times: and this the experience of all nations hath confirmed. But if a great proportion of the people be diverted from the cultiva-

tion of the soil, and allured by any means to enter into other employments in preference to agriculture ; or if devices shall be adopted to lay restraints upon cultivation, either by direct laws, by customs, or by superior profits that may be derived from other kinds of produce ; or if the actual population of the state shall be diminished by wars, by emigrations, or by other means ; if by one or all of these, or other causes operating jointly or separately, fields shall be withdrawn from the line of cultivation that have been once in culture, the soil in that case, instead of going forward in a state of progressive melioration, must (except in a very small number of singular exceptions) enter upon an opposite state of progression, until, by a gradual progress of deterioration, it shall revert nearly to the original point from which it set out ; so that the few inhabitants who remain in that country after such depopulation and consequent deterioration have taken place, will be subjected to a perpetual deficiency of food, though the same soil may perhaps have been with certainty known to have afforded sufficient food for a hundred times the amount of its present population.

This being so, it is very evident, that if a great proportion of the persons in any state who are capable of active exertions are induced to abandon the cultivation of the soil, for the purpose of engaging in manufactures and commerce, or any other employment, the progressive melioration of the soil must be from that moment arrested ; and even the productiveness which that soil had actually attained must be diminished, and of course the quantity of provisions cannot but be too small for supplying the people that remain in the

country, even if these people should be fewer than before. Thus does an inordinate desire of augmenting the business of a manufacturer, a trader, a coloniser, a warrior, or any other that can be named, necessarily tend at the same time to diminish the population and the productiveness of a country : for no one will deny, that whatever renders the means of obtaining subsistence more precarious or more difficult of attainment, must diminish population, and at the same time introduce with it a long train of other political maladies that have a perpetual and powerful tendency to diminish domestic comforts, and thus check every propensity to the natural increase of the people. While, on the other hand, so long as the people apply themselves principally to the peaceful pursuits of agriculture, population must go forward in a rapid progression, and augment to an indefinite degree ; because there perpetual abundance must insure domestic comfort and public tranquillity.

I have been at some pains to trace this natural progress of things with the more minuteness upon the present occasion, because it has a natural and necessary reference to the present situation of this country ; and fully explains the causes of that calamity under which we labour at present. Unfortunately for the human race, a political system, having the same natural tendency, though under a variety of modifications of forms, has prevailed throughout the greater part of Europe, and indeed the whole known world, with few exceptions, for several thousand years past ; in consequence of which, the human race has been diminished to an astonishing degree. Not to mention the ancient

empires of Asia, whose inhabitants for many ages prosecuted the peaceful pursuits of agriculture as a principal business, the territories of which were then found sufficient to support millions of people in abundance where one only could now scarcely find subsistence, we can more particularly refer to Palestine, which, in the most flourishing state of the Jewish history, contained at least *seven millions* of people, who were all supported by the produce of their own fields in more than abundance [the sabbatical year was a year of rest every seventh year, when no crop of any sort was either sown or reaped], though the utmost extent of their country is not equal to one-sixth part of England, and the soil is now proverbially so barren as scarcely to be able to preserve the existence of a few thousands only of the most miserable creatures. Egypt, whose population in ancient times amounted to forty millions, is now reduced to three; and, though it at the former period used to supply many other countries with corn, it could scarcely find subsistence, as we all know, a few years ago to an army of twenty-five thousand Frenchmen. Greece, Carthage, and the neighbouring states of Africa, which once swarmed with people and plenty, seem to be now afflicted with irremediable sterility. Sicily, which contained in the small territory of Syracuse alone four times the amount of the present population of the whole island, and was deemed an inexhaustible storehouse of corn for others, after supplying abundantly its whole people, cannot at this moment furnish a single bushel of corn to us, its best ally, over its present consumption; and Italy, which, according to Mr. Addison's opinion, contained

in the small vale called the *Campania* alone (not one twentieth part of the whole) more people than the whole inhabitants of Italy now amount to, experienced at that period, while Rome depended on its own fields for subsistence, a state of perpetual plenty, where want now is most frequently experienced. To recapitulate all the examples of this sort that might be adduced, would lead to too great a length for this paper; but all these, and many others that might be adduced, prove, by the most incontestable evidence, that an augmented population and plenty have every where prevailed at the same time, when agriculture was deemed a principal employment of the people; and that sterility and want, and a consequent depopulation to a deplorable amount, have been the inevitable consequences of a dereliction of that employment. I conclude, then, that the agricultural system is more favourable to population and plenty than any other employment.

INTERNAL TRANQUILLITY. Few words will be necessary to be added under this head; for no person can be so blind as not to know, that where provisions are frequently scarce, and a consequent fluctuation in price is very common, internal tranquillity cannot be preserved nearly so well as where plenty uniformly abounds. As the first is the attendant of the mercantile and manufacturing system, that of agriculture must of course be decisively preferable under this point of view.

But, independent of this circumstance, there is a much greater probability, that men who are collected in great numbers together, in places where they are

liable to have their morals corrupted and their understandings perverted by evil communication, should be led into plans that have a tendency to disturb the public tranquillity, than can take place among those who are, by the nature of their business, freed from these temptations. Accordingly, it is universally experienced, that in a manufacturing country cabals and combinations, under one pretext or other, which tend to disturb the public tranquillity, are much more frequent than among country people.

Nor are the combinations among the higher orders of merchants and manufacturers less hurtful to the general welfare of the state in another way, viz. that of misleading the judgment of legislators, so as to induce them to enact laws that have a tendency to diminish the public tranquillity. Whoever examines the proceedings of the British parliament for some centuries backward, will observe, that the tables of these assemblies have been often covered with petitions of the most pernicious tendency from manufacturers and merchants; the *first* taking upon them in general to decide upon things of which they cannot be competent judges, and in regard to which, succeeding experience has proved that in the evidence they pressed forward to give, they have often stated things as facts, which they did not nor could not know, and which have been afterwards found to be quite otherwise: and there are so many ways in which the interest of a dealer may be promoted by a measure that is pernicious to the public, and that dealer has it so much better in his power, to see this than any other person, that they often find too little difficulty in representing things;

382 *Gothic and Grecian Architecture compared.*

under a false though specious colouring, that cannot be easily discovered. In this way are our legislators on too many occasions misled, and induced incautiously to enact laws that prove highly detrimental to the public. While these two bodies of men are too great and powerful in the state, this baneful influence must ever be experienced; and in proportion as their numbers and their wealth augment, the extent of that influence, for obvious reasons, must increase also. Nothing of this kind can ever take place in regard to agricultural concerns. This is, indeed, a defect attached to that profession, under the influence of which the country at present suffers: owing to the want of concert, and want of power to bring forward representations to parliament, they allow regulations to be adopted that necessarily tend to derange their operations, and quietly abandon such departments of business as are rendered thus unprofitable: they are sufferers by it, but the public suffer in a much greater degree.

[The remainder of this article in our next.]

Gothic and Grecian Architecture compared.

[Continued from page 290.]

ALTHOUGH I have had occasion to show, in the foregoing parts of this essay, that that species of building called Gothic had been invented for the purpose of obtaining magnificent places of worship of materials that were little liable to be injured by the sudden irruptions of uncivilized barbarians; and that all the devices which the artists adopted were solely calculated to effect these purposes, and none other; and that, of

Gothic and Grecian Architecture compared. 383

course, it should be called only the architecture of a church, or cathedral architecture; yet, in compliance with a custom that is too common, and which deserves to be reprehended, it has obtained the name of the *Gothic style of Architecture*; and, as if it had been a general system, instead of a peculiar application of scientific principles to a particular department of art, attempts have been made, similar in kind to those which I had occasion to criticise in my last respecting the Grecian colonnade, to extend these principles to other departments of art to which they never could be with the least propriety applied, from which have arisen many immense and incongruous piles that load the surface of the earth as lasting memorials of the imbecility of the human mind in all ages. I have said above, that attempts have been made to extend the *principles* of that art; not because I think the phrase just, but in compliance with the common mode of speaking alike of the Grecian and that species of Gothic architecture, though, in fact, these imitators, losing sight of the true *principle* in both these cases (which was that of effecting the particular purpose required in the easiest, the firmest, and the most elegant manner the artists could devise), have contemplated the forms only which these structures presented to their eyes; and, without understanding the meaning of these forms, they have tried to imitate them in cases where such imitations could produce only incongruities that are reducible to no principle that the understanding can recognise, or a chastened taste approve. In the remarks that follow, then, I am to be understood as having in my eye only those sa-

384 *Gothic and Grecian Architecture compared:*

cred structures, for the perfecting of which the various devices were originally adopted, which constitute the essential characteristics of this species of architecture; and as totally excluding from my view all other buildings in which a ridiculous attempt has been made to introduce without cause, by way of ornament, parts of a similar form, though totally out of their proper place, exactly in the same manner as I was under the necessity of condemning as absurd the innumerable attempts that have been made to prostitute the grand ornaments of the Grecian colonnade to so many base and unworthy purposes. Let us, therefore, no longer hear of a **SYSTEM**, whether of Grecian or of Gothic architecture; being assured, that every attempt to render that general, which was contrived to answer only a particular purpose, can be productive of nothing but the reverse of an improvement in the arts. Had the contrivers of either of these original kinds of structures proceeded in the same manner as they have done in regard to those they have so far perfected, to devise plans for structures adapted to other purposes than those which they had in view, I can have no doubt that they would have effected it by means very different from those which they did actually adopt.

Having had occasion so lately to show, that the Grecian colonnade, when constructed in the manner and for the purposes for which it was originally intended, does not perhaps admit of any rival, we ought not to be surprised, if, in considering the inside of a Gothic cathedral, it should, in like manner, be found to maintain a decided superiority over every other kind of structure that can be brought to bear a competition

with it in Europe ; especially those that have been intended to cope with it by an attempt to apply the principles of the Grecian colonnade to that purpose : for, in the former case, every thing was made to give way to *internal* accommodation and sublimity of effect there ; whereas the primary object of the first was *external* decoration alone : nor shall I have any difficulty to show, that in this respect the Gothic structures have a decided superiority over the Grecian. I feel, I must own, a reluctance at being thus induced to step forward as *apparently* the depreciator of an art which I very much admire ; but this is only with a view to circumscribe it to its proper and legitimate limits.

The most magnificent specimen of the inside of a church, erected on the Grecian system of architecture, that I know of in Britain, is St. Paul's church in London ; and, although Westminster Abbey is not so perfect in its kind as many other specimens of that mode of architecture, and is besides so much disfigured by a variety of extraneous incumbrances as to detract greatly from its general effect ; yet even in its present corrupted state, though greatly fallen, it still rises proudly eminent, and seems to be (as in the language of Milton) “ not less than archangel ruined ;” so that as those who have not an opportunity of visiting more perfect structures of the kind, may, from it, form some idea of the kind of sensation which that species of structures is calculated to excite, I shall, on account of its proximity to the other, employ it for the purpose of illustration. Let any person, then, who has never thought of such structures, enter the one or the other of these

churches by the west door; and, after the first surprise, excited by the novelty and magnitude of the objects, has a little subsided, let him candidly attend to the nature of the sensations that they severally excite. In that case, I shall be very much deceived if he does not confess, that in Westminster he feels a light and exhilarating sensation that tends to elevate and expand the mind, and exalt it to a kind of sublimity of perception that makes him rise, as it were, from the earth, and expand and fill the ample space around him. The eye, whichever way it is turned, sees an amplitude of space so distinctly marked as to be sufficient to enable the mind to measure in idea its extent, without being so much broken as to separate it into parts that cannot be contemplated together. It seems, then, to be one great whole of immense magnitude; which, as it retires backward from the eye, leaves the imagination still to trace, without confusion, an indefinite extent still unseen. In St. Paul's church, on the contrary, on entering by the west door, the lowness of the roof compared to what the exterior of the building made you expect, and the uniform vault-like appearance which that exhibits; the magnitude and solidity of the pillars that support this ponderous vault, with the puerile pilasters stuck upon them; the closeness which these assume at a small distance, so as to convey the idea of a solid wall, which totally cuts off all idea of space behind it; the gloom which results from the smallness of the windows behind, totally excluded from the eye of the beholder, conjoined with the shade of the massy pillars; all these circumstances combined, tend to depress the mind with

a chilling sensation of a burial vault, more fitted for the repose of the dead than the reception of the living. Nor is this sensation abated when the eye is directed to the further end, where the small window, from the great distance, is contracted into a point; and from the closeness, parallelism, and darkness of the sides, it conveys more truly the idea of looking through a telescope than any thing else; though the light from the dome appears to be a kind of something that is not easy to be accounted for, the parts of it appearing from that view so indistinct as not to be easily recognised.

On advancing under the dome itself, the mind is rather distracted by a variety of sensations than filled with any one sort. If the eye be cast around, the circularity of the dome so ill connects with the straight lines of the other parts of the building, and the massiness of the pillars that support it is so continually broken by their diminutive pilasters, as to render it a matter of no small difficulty to form an idea of the plan; and from the same cause the real magnitude of the building cannot be conceived, as from no position can any thing be seen but parts of the building that do not exactly connect together into a whole. Moreover, the sombre gloom, which even here perpetually prevails, still impresses the mind with an idea of the mansions of the dead, rather than the resort of the living. On looking upwards, the eye is still more distracted by the complication of parts that present themselves in a mass without any claim to pre-eminence, each seeming to solicit an equal degree of attention; these consist of arches above arches; cor-

nices, architraves, pilasters, off the perpendicular, seeming ready to tumble over your head, should the cement that attaches them to the wall lose its hold; windows, like slits scarcely seen, which admit only just so much light as to make the eyes ache without informing the judgment; pictures which are just enough enlightened to appear as patches of different colours, without being so much seen as even to have their forms distinctly recognised, far less to have their merits appreciated, without the aid of a telescope, which indeed could be of no use in that dim light; and, to crown all these puerilities, a glimpse of a distant light is seen through a peep-hole in the top, just calculated to make the ignorant rustic stare, and children admire the raree-show: to obtain a glimpse of all which beauties, the curious beholder, if he does not lie down on the floor upon his back, runs a risk of cramping his neck to such a degree as not to find it an easy matter for its muscles to recover their former tone.

From these considerations, I can neither see beauty nor congruity in the inside of this immense pile; and although Michael Angelo Buonarotti, who was doubtless an artist of great eminence, and who first conceived the idea of elevating a dome upon stilts, for which device I am nothing surprised that he should have claimed some merit, because of the natural partiality that a man entertains for his own inventions; yet I consider this only as one of those aberrations of the mind into which it is apt to fall, even in its most vigorous state, when it is taken, as it were, by surprise, when a novel idea presents itself. The Pantheon at Rome,

from which he confessedly borrowed his idea of St. Peter's dome (of which St. Paul's is a professed imitation), is a noble structure, fully enlightened, as I conceive, by the large aperture above : and were it not for the detached tabernacles of columns in the inside, must have completely filled the mind without distracting the imagination in contemplating it : yet it is very easy for any one to conceive, that the sublimity of effect resulting from the fewness of the parts must be entirely lost when it is elevated above the proper reach of the eye, and the bottom part of it, instead of being a uniform unbroken rotunda, is composed only of a congeries of stilts. In this instance, as in most others, where a man, let his talents be what they may, becomes an imitator instead of an inventor, and tries to unite incongruities together which are separately beautiful, it happened that a monster was produced that is in all respects inferior to its prototypes. The dome itself, we have seen, was an imitation of the Pantheon of Agrippa ; and the raising it to a height from the ground is as obviously an idea borrowed from the central lantern of the Gothic cathedrals. The only thing then that was new in this case was, the combining the rotundity and dome at top with the form of the cross below ; and to obtain this he was under the necessity of sacrificing the simplicity of form, the smallness of the columns, and the blaze of light which render this part of the Gothic cathedral so remarkably cheerful and pleasing : for not only do the large windows at each end powerfully illuminate the transept in these Gothic buildings, but the light from the side windows of the church adds still to the cheerfulness of

it, while the four windows in the sides of the lantern above, descending to near the point of the arch below them, and reaching nearly to the flat part of the roof above, give a degree of illumination there approaching to that in the open air at noon day. The great Angelo, therefore, had not much reason to plume himself on the excellence of this device; nor ought those persons to be held as blameless who have blindly imitated these defects. But the deference that we naturally pay to the names of those who are deservedly held to be great in other respects, may perhaps be admitted as a sort of apology for men of meaner talents when they shall be thus misled. Another aberration of that great man, originating in an idea of supereminent refinement, occurs in the same structure, in which he has made use of twisted columns; a device that, thus sanctioned, has fascinated the chaste eye of even Raphael Urbino himself, who has introduced them into one of his Cartoons. No man can ever be so perfect as always to avoid errors.

But though I have not hesitated to bring Westminster Abbey as a contrast to St. Paul's Church, London, I am far from wishing the reader to rest satisfied with the idea that he will thus attain of the effect which Gothic cathedrals, internally viewed, are calculated to produce upon the mind when considered as objects of taste; for when you go to the more simple and less encumbered structures of this sort, such as the cathedrals of York, Salisbury, and others of a similar kind, their superiority over St. Peter's, Westminster, is such as to cause it to be instantly recognised that they cannot admit of a comparison. But if even the most perfect structure on the Grecian model that ever was

exhibited to the world (and this I conceive to be St. Peter's at Rome, and its imitation St. Paul's, London), must shrink from the comparison with even this imperfect model, it must tend to exalt those of a more perfect kind to a very high degree of pre-eminence indeed.

Although it is impossible to convey to any reader, without actual inspection, a competent notion of the full impression that would be produced on his mind by an impartial survey of the inside of these two kinds of buildings, yet he may be easily enabled to form a faint notion of it merely by casting his eye upon the diagram annexed, which represents a plan of part of a church, in which the line A B represents the middle of the nave. On the right hand side it is distributed nearly in the same manner and proportions as in the west end of the cathedral of York, and on the left hand side as in the cathedral of St. Paul's, London; with the thickness of the pillars and walls and dimensions of side windows nearly in their due proportions respectively.

To conceive an idea of the effect, suppose yourself to be placed at A with your face towards B. On looking to the right hand side, and passing the eye successively along from the nearest to the farthest end, all those objects that are shaded would be concealed from the view, and those which are left light will be seen. Thus it appears, that the first window is completely seen; the two edges of the second are slightly perceived, so as to be distinctly recognised; the third is completely seen; the fourth, fifth, sixth, and eighth, are in part seen, so as to be all recognised; and the ninth

is full in view : so that of the nine windows eight are seen in this position without moving ; and the same distinctness must be observable in every other position that can be assumed.

Turn now to the left hand, and by the same mathematical rule of deciding you perceive that the 1st and 9th windows only are fully seen, and the 3d in part ; all the others are totally hidden from the eyes, so that three only of the nine, instead of eight, can be recognised. The eye, too, winds round the slender columns on the left side with an easy and pleasing sensation, and without any effort glides along the shaft upward till it reaches the top, where, with the same ease and increasing pleasure, it follows the beautiful divarication of the ribs that spread under and support the roof. These ribs, and the groins that unite them, serve as a sort of scale to mark distance, and thus give an idea of extent without effort.

On the other hand, the eye, when turned to the left, meets a row of massy square pillars, which at a little distance appear to be an uniform wall. These are connected by deep, solid, smooth arches, surmounted by an architrave, frieze, and cornice, in one continued line from the beginning to the end, which is crowned by a uniform coved vault : all of which circumstances so totally exclude the idea of space behind, as to make this middle aisle be considered as the whole of the church ; a large space is thus, as it were, artificially contracted into a small one ; and the imagination is forced to draw a conclusion very short of the reality.

But the evil does not rest here. The windows are so deeply buried in a thick wall, and are besides so far

compared with Gothic.

393

394 *Grecian Churches compared with Gothic.*

contracted in size, when compared with those on the other side (being, when height and breadth are both taken into the account, less than one-fourth part of their size), that they afford but a glimmering of light even upon the side ailes; and the little light that there enters being intercepted in its passage into the nave by the massy pillars, the deep shade occasioned by each of which extends to the very centre of the nave, as is represented at the pillar C, throws upon the whole, an impenetrable gloom which the brightest sunshine is not enough to render in any degree cheerful; whereas on the other side, the shade of the column, as represented at D, is so small as to be scarcely perceptible. Even under this point of view, the difference between these two kinds of structures is obviously extremely great. But when we remember, that the Gothic nave is illuminated also from above by a double range of spacious windows, that throw an irradiation of light upon the top, which, being reflected downward, gives a glowing lustre through every part of the structure that excites a sensation cheerful and exhilarating as the open air, no wonder that every mortal who passes the threshold of such structures feels a pleasurable sensation that he cannot repress, not even excepting the bigoted advocates for the Grecian system, who, in spite of themselves, are forced to confess, that these structures, with all their defects, are well calculated to impress the mind with ideas of sublimity and grandeur.

A few other particulars remain, which will be briefly noticed in the next Number.

ELUCIDATIONS CONCERNING INDIAN WEED.

To the Editor of Recreations in Agriculture, &c.

SIR,

August 28, 1800.

IN your remarks on “ Filamentous Plants,” Number Sixteen, page 314, you observe, that “ there is a kind of sea *grafs* which comes from India not thicker than a hair, which is sold by those who deal in angling tackle under the name of *Indian weed*, which will bear a greater weight, without breaking, than perhaps any other filament of the same size yet known ; you do not find, however, that your friend Dr. Anderson has been successful in his researches after this *plant*.”

I believe that most anglers are well acquainted with the article above described ; but, for want of curiosity, few have troubled themselves about the nature of it, or ever questioned the commonly-received notion of its being a real *plant*. For my own part, I have long entertained a different opinion ; and am now confirmed in my belief, by a few simple experiments, that the article sold at the fishing-tackle shops, under the name of *Indian weed*, or *Indian grafs*, is not a *vegetable*, but an *animal* substance.

In the first place, it exhibits the same *appearances, while burning*, as hair, silk, or feathers. In the next place, it emits the same empyreumatic *odour* which distinguishes all animal substances in combustion. And, in the third place, I have, since reading your essay, subjected it to a test still less equivocal, viz. I made a small coil of *Indian weed*, another of *horse-*

396 *Elucidations concerning Indian Weed.*

hair, a third of *silk-worm gut*, and a fourth of common (lint) thread. These I put into a quarter of a pint of strong wood-ash lees, and boiled them all together in an iron saucepan, till the liquor was nearly exhausted. I then examined the residue; and found that the *weed*, *horse-hair*, and *gut*, had totally disappeared; but the thread remained entire, as when first put in. That the *weed*, therefore, as well as the *silk-worm gut*, is an animal substance, I am firmly persuaded; but from what animal, or in what manner either of them is obtained, I am totally ignorant, though I have endeavoured repeatedly to get information. I have been told that the *silk-worm gut* is the real entrail of one sort of silk-worm, obtained by destroying the caterpillar when just preparing to spin, macerating its exterior integuments, and drawing out the entrail to a certain length. And I once was assured, that a similar mode was practised upon a large kind of caterpillar in China to procure the *Indian weed*: but the information I received was neither *particular* enough, nor of such positive authority as to preclude me from further inquiry*. The extent, sir, of your correspondence may probably afford you better means of success: and I am confident that you will give a very singular satisfaction to many of your readers, if you should think it an object deserving your inquiry.

* This is another article sold also at the fishing-tackle shops, and differs from the Indian weed in being finer, stronger, more transparent, and less brittle; and, on all these accounts, preferred by anglers to the weed itself. It is brought from the *Mediterranean*; the Indian weed from *China*.

Should it turn out, as perhaps it may, that this extraordinary filament may be obtained from some animal familiar to our own climate and country, and by some process very easy to be adopted, I need not hint to you of what essential service the discovery may prove at large, or how favourable to your useful object in particular. I am, sir, yours, &c.

AN OLD WALTONIAN.

P. S. In passing over a college quadrangle a few days since, I was struck with the very vivid appearance of some few spots upon the grass-plats, which had retained their verdure, while all the rest of the herbage was withered with the drought. On examination, I found that these distinguished spots consisted almost entirely of the *galium verum*, and the *lotus corniculata*. Qu. Might not this quality in these very common plants of enduring such remarkable heats as we have experienced this summer, suggest some useful hints for the improvement of dry pastures?

Additional Remarks.

The above communication is extremely acceptable. It appears to me undeniable, from the above experiments, that the object in question is an animal substance; and it is a matter of much importance that it should be farther elucidated. The brittleness, when doubled in, is an uncommon peculiarity.

I am satisfied that the silk-worm gut is also prepared in the way he mentions; but being no angler myself, it is to me a new article.

It has often occurred to me, that various uses might be thus made of the substance with which nature has provided caterpillars, and the larvæ of various insects, for the purpose of securing themselves while in their *pupa* state. The silk is actually formed in the bowels of the caterpillar, where it remains in a fluid state until it be forced out through the apertures provided for that purpose, when it almost instantaneously assumes the form and consistence of a silk thread. Might not this substance, if drawn out by art, or exposed to the air under any other form than that of a thread, thus be made to assume the consistence and quality of silk? If it were spread out, suppose in the form of a thin continuous film, might it not thus form a kind of cloth or paper, of the consistence, and having the qualities of silk, without weaving? Might it not thus possess the quality, perhaps, of being impervious to water, and other fluids that do not act upon silk, as well as other valuable properties? In corroboration of this conjecture, I beg leave to mention a curiosity that I lately saw in the possession of Mr. Francillan, Norfolk Street, Strand, London (whose fine collection of insects is perhaps unrivalled in this country), a painting made upon a substance that has much the appearance of cobweb, which is so extremely thin and transparent, that the finest strokes of the pencil are alike distinctly seen when laid upon a piece of white paper, with either of the sides turned upwards; the painting being only reversed. This picture is about six inches square. It cannot be cobweb, for it has not the adhesiveness to the touch that so peculiarly cha-

characterizes that substance; besides, it is much clearer and firmer than any cobweb I ever saw. I conjecture that it has been made from the silk reservoir of the silk-worm, by some process similar to that indicated above, while that substance still remained in a state of fluidity. I therefore beg leave to recommend this subject to the notice of the curious, as one that is highly deserving elucidation, being the probable source of many important improvements.

It is well known, that many of those larvæ which spin no sort of silk, emit, for the purpose above specified, fluids that possess qualities which no other substance in nature is known to possess. Most of these, as soon as they are emitted by the animal, instantly consolidate, and become a cement of a nature *sui generis*, by which the bits of sand, and other objects that they employ for their own purposes, are instantly cemented together, and from that moment become indissoluble in water, and many other fluids. Some of them become hard and brittle, others remain soft, tough, and coherent; sometimes greatly elastic, in other cases altogether unyielding. It is unnecessary to say, that, were we able to obtain fluids possessing these qualities, they might be employed on various occasions as cements or varnishes that might prove eminently beneficial to society; nor does it appear to be impossible to obtain them for these purposes, more than it is to obtain a single drop of the Tyrian purple fluid from the purple fish.

The plants mentioned in the P. S. are deep-rooting plants, like lucerne and sainfoin, and on that account preserve their verdure in dry weather. The last may be cultivated with advantage in many cases.

Reading Memorandums.

MR. EDITOR,

THE inclosed memorandums were found in the repositories of a deceased friend. They seem to have been passages that struck him in the course of his reading; if you think they can serve with propriety to fill up a small gap occasionally in your useful miscellany, they are much at your service. M.

About a century ago we were mad with *pretences* to piety, for piety it ought not to be called. After this religious frenzy, or mad hypocrisy, had had its play, we returned back to the primitive plan of true reformation: but, overshooting the mark, we went into the other extreme, and religion was put out of countenance.

If the graces of person and a cultivated understanding are superadded to virtue, it will appear indeed more like itself; but at any rate let virtue be secured.

Imagination is an inferior faculty, and ought not to be indulged at the expence of reason, which can only be satisfied with a contemplation of realities.

The original scriptures of the Christians display the *being of a God* with a refulgence that all the arts of criticism and metaphysics cannot darken.

The business of the fashionable world is no longer to make formal and tedious inquiries about religion, but by delicate and ungenerous pleasantries, with an air of superior understanding, to expose it to contempt.

Acknowledgments to Correspondents deferred till next Number.

24.

FEBRUARY 1801.

RECREATIONS
IN
AGRICULTURE, NATURAL-HISTORY,
ARTS, & MISCELLANEOUS LITERATURE.

Nº 6. VOL. IV.

AGRICULTURE.

Notices of an Italian book on agriculture, printed in the fifteenth century, with extracts from, and remarks upon it.

I MEAN to give my readers on this occasion an agricultural treat, in presenting them with some extracts from an ancient treatise on agriculture, which seems to me to be written with remarkable spirit, much patriotic zeal, great knowledge of the subject, and liberal views of the benefits that society would derive from a proper application of skill and perse-

VOL. IV.

2 D

verance in the practice of agriculture. These extracts are made from an Italian treatise, entitled, *Ricordo d' Agricoltura, de Sr. Camillo Tarello de Leonato*, which was first published in Mantua in the year 1577, again in 1622; at Venice in 1629; and reprinted in Bergamo by *Giovanni Santini*, anno 1756, in quarto. I have not, however, been able hitherto to obtain a sight of the work itself, though I have been in search of it for some time past (and will thank any of my readers who have been so lucky as to see it, to intimate where it can be had, or seen). My knowledge of it is only obtained at second-hand from the *Memoirs of the Economical society of Berne* for the year 1761, from which French version only I am enabled to translate the following extracts. The manner of writing is so peculiar, that I have not a doubt that the whole is genuine. The French translator says, that the book itself was addressed by the author to the senate of Venice, who expressed their sense of the excellence of the work and the patriotic views of its author, by not only conferring upon him the sole privilege of selling his book, but decreeing at the same time, that he should be entitled to demand from every person who should adopt his system in practice, at the rate of two *marchetti* per arpent (about one half-penny per acre), a gratuity that perhaps indicates more of kindness than judgment. The treatise itself consists of two parts, viz. 1st. a memoir addressed to the senate of Venice upon the means of making agriculture flourish in their states; and 2nd. practical instructions how it should be executed; the first of which only I have seen. The extracts follow.

A DISSERTATION ON AGRICULTURE BY MR.
CAMILLO TARELLO.

Serene Prince !

Magnificent and powerful Lords.

“ When I here present to your S. and E. E. proofs, which many persons have seen, of the things that I have the honour to propose, I hope in God, and I earnestly pray, that he will direct my discourse in the path of truth and persuasion, in order that my proposition may find favour not only with your S. and E. E. but also that it may prove acceptable to all your subjects.

“ To give all the perspicuity in my power to the truths which I have proved by experience, and which I am about to establish, I shall first examine the causes why we commonly reap such small crops of grain ; I shall afterwards point out the means by which abundance may be obtained ; and shall conclude with demonstrating the possibility of it, by each of the three ways by which conviction may be established : I mean to say, by the authority of rural economists, people of respectability, sensible and enlightened, and therefore worthy of credit ; by valid reasons ; and finally by experience, which speaks to the eye : all of which together constitute complete demonstration.

“ The subject is of the last importance, agriculture being the basis of the state, upon which at all times rest the honour, the prosperity, and the comforts of the people. I pray, then, your S. and E. E. graciously according to your praiseworthy custom, to listen to

me, and not to form any judgment until I shall have finished my discourse. I can with confidence assure you beforehand, that I shall not only propose good things, but the very best (without occasioning great trouble or expence) that have as yet been proposed by any one.

“ When we consider that every stalk of wheat carries 50 grains (we shall suppose it to be so), we might infer, that if we sowed it, and if all the grains came up, we should gain at the rate of 50 for one; that is to say, we should reap 50 times more than we sowed: but we are far from reaping such an abundant return. This failure can only happen because all the grains do not spring, or do not prosper rightly; and this can only arise from one or all of the seven following causes, without taking into the account *extraordinary* seasons, or singular accidents.

“ That is to say: it must proceed either 1st. from the seed; 2nd. from rain at the time of flowering; 3d. from winds when the stalks are far advanced; 4th. from birds that consume the grain that was sown; 5th. from worms or insects; 6th. from the earth itself; or, 7th. from the cultivator himself.

“ The seed is not the cause: for, of two things, one must happen; either the seed was good, or it was not. If it was not good, it is clear that the grain would not spring up; but if it was good, as we suppose, every grain could, and ought to produce at least one stalk of 50 grains. Another proof is, that if we plant each grain at a proper depth in the earth, and if we sow at random an equal number of the same quality on the

same ground, the first will all spring up, but not the last.

“ Neither ought we to attribute it to the rain, or the winds at the time of flowering : because we do not reap 50 for one even when the weather is fine : and even when each stalk carries 50 grains we do not reap 50 times the seed.

“ Nor ought we to accuse the birds of the air. Do we not see that lupines, which the birds, because of their bitterness, will not taste, do not all vegetate ? For if they all sprung up from the earth we should gather more lupines, seeing that each stalk carries from 50 to 60 seeds. Besides, what the birds eat is inconsiderable.

“ Worms and insects are not the cause, for three reasons : first, our crops are not so abundant as by the statement they ought to be, even when we see neither worms nor insects ; in the second place, it is even so with lupines ; in the third place, worms would ravage places entirely (which does in fact sometimes happen), but this would be so visible as to be at once distinguishable from the common case. Farther, it is an extraordinary event, and very rare.

“ We may say the same thing of mists, cold, bad weather, and reptiles, or other destructive animals. Though these animals do not every year endamage our fields, we constantly reap less corn than by the facts stated we ought to do.

“ Neither is the earth, considered in itself, the cause of this failure of the production, for the peculiar endowment the Creator hath conferred upon it is that of perpetual youth and fertility, as *Columella* agree.

ably saith in the first chapters of his first and second books. But the earth and nature are the same as at the beginning.

“ If every Roman family could subsist upon two jugera, which were assigned to each of them by Romulus (as Pliny assures us, l. xviii. c. 2.), and the consul Q. *Cincinnatus* upon four, which remained to him out of seven (according to *Val. Max.* l. iv.), how much greater reason have we to find ourselves abundantly supplied, who have a great deal more land,—their *jugerum* being much less than our acre ?

“ We can ourselves see, upon the fields of our laborious neighbours, the possibility, and even the reality, of what I advance ; but, alas ! we do not bestow the attention that the thing deserves. Whoever will not believe it until he hath first seen it with his own eyes, may make the following trial : let him take, as I have already said, 200 grains of wheat, and plant them in the earth at a uniform and proper depth ; and take 200 other grains, and sow them, as usual, upon the surface of the same ground equally prepared ; and he will see, that all the first shall spring up and prosper, but not the last ; because they have not been placed in circumstances so favourable for vegetation as the first. The earth then is not the cause of this difference, whether it be more or less fertile.

“ But if the reason why we do not reap 50 for one cannot be generally attributed to any of the circumstances which I have named, we must of necessity attribute it to the ignorance, the negligence, or the indolence of the cultivators ; for we do precisely the reverse of that which the ancient Romans practised.

They laboured often and sowed little; every family lived upon the produce of his own two small *jugera*: but we, who labour little, and sow a great deal, are in the condition denoted by the proverb of *Petrarch*, He who grasps at too much retains little*.

“ Abstraction being made of superior causes, which are not within our power, and supposing that the seed is good, the art of obtaining rich crops may be reduced to two maxims: *to act with precaution, and to put the land into such condition as to be able to operate.* If we want to render it more fertile than it naturally is, that is to say, when it is left to itself (which is possible to an eminent degree), no means are more efficacious than *to leave it to rest, afterwards labour it well, and finally dung it abundantly,* after the manner that I shall prescribe.

“ If we cultivate our fields in the way hitherto used among us, there are many (without speaking of those which are sown every year) that rest scarcely four months, because, after turnips, buck wheat, and other inferior crops, which are reaped in September, they begin to sow their legumes in the month of February; and the other field, which they begin to labour in the month of February in the year of fallow, rests but about seven months. We ought not then to be astonished that a field ill prepared, so much exhausted, and ruined, should yield little produce. When, on the contrary, the fields are cultivated according to the rules that I shall give, they will repose (which is the best reparation that can be procured for the country) two years, and the earth is well pre-

* Tutto l'viando abbraccio; e nulla stringo.

pared even with less trouble or expence ; *for it is easier to cultivate ONE field well*, and dung it completely, than to do the same to *two*.

“ Your S. and E. E. know, that an agent cannot operate upon any body, unless that body be in a fit state to be operated upon ; and the philosophical principle is very true, *that we should not perform by means of great exertions, what can be done equally well by easier means*. I would say, that the seed, which I regard as the agent, does not produce so much as it might do, because the earth is not prepared and manured^{as} it ought to be to produce that effect.

“ I Camillo Tarello de Leonato represent then most humbly to your S. and E. E. in consequence of the orders issued from your council the 26th of September 1566 :

“ That the labour which hath till this time been
 “ performed on two parts of land for wheat (each of
 “ which has been ploughed four times) shall from
 “ henceforward be given to one only ; so that it may
 “ be ploughed *eight* times, including the seed furrow.
 “ I mean to say, that the whole of the arable ground
 “ (except the particular enclosures next the house,
 “ which are sown every year, on account of the proximity and abundance of dung) shall be divided into
 “ four equal parts, as nearly as it can be done ; and
 “ that *one* of these portions only shall be sown with
 “ wheat each year, but alternately ; which ought to
 “ be previously ploughed eight times : two others
 “ ought to be in grass ; and the fourth, as I have just
 “ said, is destined for fallow ; that is to say, to be
 “ under a state of tillage throughout the whole year.

“ He then, for example, who used to have ten acres
“ in wheat, ought in future to sow only five, and so
“ of others; on the contrary, he ought to apply to
“ the *five* acres only all the manure and all the labour
“ which he used to bestow upon the *ten*; that is to
“ say, he ought to plough it eight times (unless the
“ soil be extremely light), and give it double the
“ quantity of dung.

“ He ought to give it the first furrow in the month
“ of October or November, ten months nearly before
“ the time of sowing, or sooner if he can; but always
“ in a dry time, and to dung before the last plough-
“ ing, in the manner that I shall describe: nor ought
“ he to sow above two thirds of the quantity of seed
“ that is generally allowed over all this country.”

“ Every cultivator who shall adopt this method, and
follow the precepts that I shall afterwards more amply
detail, may depend upon obtaining the twelve follow-
ing advantages:

“ 1st. This manner of cultivating the fields dimi-
nishes the trouble and expence, it being more easy to
plough one acre eight times, than to do two acres four
times; because, after the third ploughing, one acre and
a half may be ploughed in the time that was formerly
required for one only; and, if you begin in the months
of October or November, while the ground is friable,
it can be continued in the following year when busi-
ness is not pressing; so that by the end of May, or
nearly so, it may have received four ploughings. In
this manner the four summer ploughings will not re-
quire such weighty ploughs as are now in use, to
the oppression of the poor beasts, because the land

will be much lighter and more manageable in all respects.

“ 2nd. By so many ploughings the seeds and roots of weeds will be destroyed, which rob the wheat of its nourishment, suffocate it, and prevent it from growing.

“ 3d. These frequent ploughings, and the other practices that I shall point out, will procure a great deal more wine, legumes, millet, panic, and all sorts of summer produce.

“ 4th. A field rested, prepared, and manured in this manner, will produce more than double the quantity of wheat that two of the same size would otherwise do, as I have oftentimes experienced; that is, more than double the free produce.

“ 5th. Farther, we shall save two thirds of the quantity of seed that we have been hitherto in the practice of employing; for, in sowing in future, not the half, but the fourth part only of our arable fields, we thus save at once the half of the seed; afterwards in sowing only $\frac{2}{3}$ of the ordinary quantity on the one quarter, we save besides $\frac{2}{12}$, that is to say, $\frac{1}{6}$ of the whole seed; but $\frac{1}{2}$ and $\frac{1}{3}$ make together $\frac{2}{3}$ less than used to be employed formerly.

“ 6th. We shall also have a great deal of straw of all sorts for many purposes, and especially for litter, and dung, so useful, indeed indispensable.

“ 7th. We shall have abundance of hay and forage for sustaining a great many beasts, because we shall be able, and ought to sow clover upon two-fourths of the fields, where it will grow extremely well; these will repose two years under that green cover, to be

afterwards dressed, laboured, and sowed with wheat in their turns : for, once more I advise, that not more than one-fourth part of the arable ground should be sowed with wheat, and to plough up another fourth part immediately after the wheat is sown before winter : on the contrary, the other two-fourths will not be laboured for the space of two years. But, as the destination of the earth is to make continual productions while it is in a state of repose, we shall do well to follow the indications of nature, and aid her to produce clover, and other plants fit for forage, which serve as a great resource, as well in regard to the hay which it affords, as to the melioration that the soil receives from the roots. In the country of *Brescia*, they obtain abundant crops of the finest flax upon fields from which they have shortly before cut a quantity of clover ; they hire these fields at a great rent, not so much upon account of the richness of the soil, which can be watered, as because it has been just broken up from clover ; and this is only for the purpose of sowing flax or millet : why not for wheat ?

“ 8th. The eighth advantage will be, that the field resting regularly two years (I say with Virgil, the ground rests when it is not laboured), being meliorated by the roots of the clover, afterwards being well dunged, laboured, and harrowed twice (as I shall teach) ; if all this be done, our crops will be doubly more abundant than formerly ; as my memoir clearly shows to be a fact established upon the authority of the most sensible and enlightened men that there are in the world respecting agricultural concerns, and upon the most unequivocal proofs ; and practice will soon convince the most incredulous.

“ 9th. One of its most considerable advantages is, the facility that it affords of rearing a great number of cattle, because of the quantity of hay and green forage that we shall have. Then may be kept a great many more horses, oxen, cows, sheep, and poultry. Who is ignorant of the uses that may be made of these for food, clothing, and labour? Those who formerly must have had two yokes of oxen for the plough, can do with one pair only, and in their stead can keep two or three cows; for, seeing that labour is diminished, and nourishing forage augmented, this one pair will be sufficient to labour the land, as under this system the ground becomes from year to year more easily laboured.

“ 10th. Hence flows naturally the tenth benefit; which is, the quantity of manure that the augmentation of beasts and of straw will furnish; and no good farmer will neglect to make this an object, if the means of doing it be only pointed out.

“ 11th. Having abundance of hay, we can break up and renew, successively, a fourth part of our ordinary grass fields, which were not intended for the production of wheat (at least if they be not too steep or too wet), by paring their surface, burning the sod, and afterwards labouring them; sowing the first year millet; the second barley; the third either rye, far, or wheat; and at the end of the fifth year lay them down again into grass, having burnt the stubble in the manner I shall afterwards describe. This course ought to be continued until the whole circle be completed in the course of twenty years.

“ But after these four quarters have carried five

years grain, we must go over them anew, beginning at the first dressed field as before, but not by incineration (which would now be improper): we ought only to pare and labour that quarter which had been 15 years in grass, and sow it with wheat, and continue it in that order. This practice is profitable for men, and of use to the fields. For men, because we thus obtain a greater proportion of nourishment directly; and for the grass fields, because nothing is more advantageous for grass grounds than this refreshing or renewing of them, according to the testimony of *Columella*, l. II. c. 18, and *Pliny*, l. XVIII. c. 28. Nor ought we to imagine that the quantity of hay or pasture will be thus diminished, although we have only $\frac{3}{4}$ of the ordinary quantity in grass: for, by experience it is established, that in order to have a great deal of hay it is not necessary to have much land in grass, but to have that land *in very good order*. It is impossible well to dress the whole, without renewing a part from time to time. Employing the same care upon three-fourths that used to be bestowed upon the whole, and using the dung that is produced from the straw of the cultivated fourth, these three-fourths will produce more hay than the whole did formerly; especially if we do not employ the whole dung in autumn, but a part of it also in February; which can be done, considering the quantity of straw and beasts that are kept upon it: to say nothing of the melioration of the soil from the roots of the clover.

“ 12th. Lastly, the twelfth good effect that will result from this new mode of culture is, that barren and infertile land will become gradually better and better,

richer and more productive : for it is the nature of this our earth, that by cultivation and manuring it becomes always better, as we clearly see by experience. *Valerius Maximus* affords us a striking example of this in *Masinissa* king of Numidia, who made agriculture in his dominions so to flourish, that he left his kingdom, which he had found desolate and barren, full of riches, and abundance of every kind. *It is in our power to do the same with our own country.* On the contrary, it is not less true, that even if the land were good and rich, it will not carry grain unless it be well cultivated, exactly as is the case with the human mind, whose powers can only be developed by study and continued exercises, according to the beautiful comparison of Cicero (*Nam ut ager quamvis fertilis, sine cultura fructuosus esse non potest ; sic sine doctrina animus.* *de Tusc. 2.*) By labour we may acquire not only necessities but superfluities, and a *steril field may be changed into a pleasure-garden.*

: “ Having seen that cultivators commit many obvious faults, of which one paves the way to another, in the noble occupation of agriculture (which the wise *Socrates* calls, with good reason, the mother and nurse of all the arts ; and which employment *Cicero* thus characterizes, in recommending to his son the perusal of the writings of the elder *Cato* : *omnium rerum ex quibus aliquid exquiritur, nihil est agricultura melius, nihil uberius, nihil homine libero dignius*), and being persuaded that we can perform no service more acceptable to God, than to imitate his virtues, though at an infinite distance, in being useful to the creatures that he hath made, my mind burned with a desire to contribute

something to the advancement of agriculture. But, considering that prolix treatises are burdensome to the memory, and that they seldom make the impression that is wished for or expected, I have selected and compressed the following rules and principal maxims, of which no good agriculturist ought to be ignorant, but ought to observe and carefully put in practice on all occasions. And in order that the matters may be separated according to the objects, and in consequence be easy to find, I have disposed them in an alphabetical order, subjoined to this memoir. I thought it necessary, with a view to add weight to my propositions, to cite the passages of those ancient authors in whom we ought to believe, as we do in *Hippocrates*, *Galen*, and *Avicenna* in medicine.

“ I do not quote these authors from ostentation, neither have I borrowed my plan from any one of them, or compiled it from the whole together. No; it is new. All the world knows, that frequent labouring is good and useful; but in spite of that persuasion we do not practise it. We see and approve the best, but do not pursue it. And why? The trouble of it frightens us. Having discovered this weakness of human nature, I enumerate the means, and make the motives be felt for going on with gaiety of heart and pleasure, by not only diminishing the trouble and expence, but considerably augmenting our income at the same time. These means differ from the common routine at present, as the desire of a thing differs from the apprehension of another quite the contrary.

“ We see that men neglect to labour and stir the land frequently, as tiresome and expensive; but if they

maturely deliberate on what I say in this memoir, and on the instructions which will follow it, they will wish to carry it into execution; and they will afterwards see that my method is preferably excellent. It is true, that I have learned, and drawn from respectable authors of antiquity, useful maxims, of which I have profited; but it will be recollected of the bees, that though they collect their honey sometimes from one flower, sometimes from another, yet the honey is nevertheless not the work of the flowers but of the bees*.

“ Neither Virgil, nor any other of the ancients, have advised, at least to my knowledge, to put into temporary grass almost three-fifths of the whole arable land, to the great advantage of the whole country. I have gone with Columbus of Genoa, as Charles V. expresses it,

PLUS ULTRA,

and I have dared to go beyond the pillars of Hercules.

“ The greater part of mankind, governed only by their senses, believe in nothing unless they have seen it with their eyes. But they who recollect that it is possible to make new discoveries (witness clocks, paper, printing, gunpowder, and the new world itself) will believe in what I propose, even before they have seen it proved; and this because of the authority of persons of experience and probity to whom I refer, and the number and the weight of the reasons adduced in its favour; and when they shall be convinced that the

* Metastasio, with his usual elegance, beautifully expresses this idea:

L'ape e la serpe spesso
Succon l'istesso umore:
Mà l'alimento istesso
Cangiando in lor si va.

counsel I give is good, they will begin to follow it, to execute it, and to proceed always *farther and farther*. Q. U. F. D."

Who does not join in honest exultation at the expansive burst of benevolence that warmed the bosom of this worthy man? With me, however, this sensation was blended with admiration of the clear and distinct perception which this person had evidently obtained of what I conceive to be the true principles of practical agriculture, on which every real improvement in that art must ever be grounded, under whatever modifications these, from the progress of knowledge, and variation of circumstances, may require; and these principles are here more clearly enounced than in any other work that I have ever seen: nor did I believe that any thing of that nature had ever been published until this book fell into my hands a few weeks ago. These fundamental principles are, "first, a thorough and
 " complete melioration of the soil by frequent tillage,
 " especially if the land has been long under a continued course of corn crops, thus to free it completely
 " from weeds both annual and perennial; and *plentiful*
 " *manuring*, *at once* (instead of often and trifling
 " *manuring*), and thus putting the ground in good
 " order; and afterwards, by a judicious system of management, avoiding ever exhausting it; but continuing, by a careful application of the manures that
 " may be thus obtained from the ground itself, to
 " make it *increase* in fertility, by a gradual progression from that time forward without interruption.

“ Second. By a regular change from corn to grafs,
“ without keeping the ground for a long series of years
“ under either of these courses of cropping, unless in
“ very particular cases ; on which practice a very long
“ experience has satisfied me, success in farming, and
“ every essential improvement in agriculture, must be
“ grounded.

“ Third. In never laying ground into grafs but when
“ it is in very rich condition. For, although ground
“ may be made too rich for carrying corn crops, I do
“ not know that ever it can be too rich for grafs : and
“ it is only when grafs land is in that very rich state
“ that it can be continued in grafs for a length of time
“ without deterioration.”

It has often appeared wonderful to me, that these principles of agriculture, which have been found so invariably beneficial wherever they have been applied in farming ; and in adhering to which, in a more or less perfect degree, every practical improvement in *agriculture*, properly so called (I mean, in the acceptance of that word by the king of Brobdignag), that I have seen has been grounded, should never have been clearly *enounced* ; at least so far as I have yet seen, in any elementary book upon the subject ; though it is impossible for one who is acquainted with these principles, not to collect from detached directions every where, that their influence has been recognised in a greater or smaller degree by every practical person. It now appears still more extraordinary to me, that after these principles had been thus clearly enounced, and communicated to the public in this Italian work, they should ever have been lost sight of by practical

writers on agriculture. But this last circumstance seems in some measure to accord with my own experience; for, though I have often inculcated to every speculative person that I have met with, who was keen in pursuit of agricultural improvements, the necessity of attending to them, I do not know that ever I have met with more than one such person, who seemed to be able to form an idea of their importance. The heads of these persons are constantly hunting after something *new* and *brilliant*, which seems to promise them astonishing success through the exercise of their own ingenuity; in consequence of which, the only solid bases on which real advances can be made, are perpetually abandoned, for chimeras that can terminate no otherwise than in accumulated expence and waste and endless disappointments, which retard instead of advancing the progress of agriculture. Authors too, who write for bread, and temporary applause, finding that such *speculative* notions are peculiarly calculated to please that class of persons who are most in the habit of buying such books, are at pains to adapt their writings to their taste, and thus furnish abundant materials for their imagination to work upon. Thus have books on agriculture fallen into disrepute among actual farmers: and *gentlemen-farmers*, by their absurd practices, have too often become as beacons to warn real farmers to shun those practices that have been exhibited on their fields, rather than incitements to follow them.

Considering the time in which Tarello wrote, and the circumstances in which he seems to have been placed, the above extract appears to me to exhibit traces of a great mind capable of accurate discrimi-

nation, and of collecting detached facts that fell under his observation, and connecting them together, so as to deduce from them unerring conclusions. Many particulars, it is true, of great importance in agriculture, which experience hath since that time enabled us to know, seem either to have been unknown to him, or not to be enounced in the short abstract of his system here exhibited (for we must not do him the injustice to judge finally, without seeing the detached directions to which he often alludes); yet, although these discoveries would induce many modifications of his system that he did not in all probability know of; and, although future discoveries will doubtless enable others after us to improve upon any thing we at the present time could add, yet the basis of the system remains stable as the foundations of the earth, that cannot be shaken; and I most sincerely regret that a conviction of this truth should not be more generally recognised than it is at the present hour.

Among those discoveries of later times must be ranked horse-hoeing, which, under judicious management (a thing that remains still to be taught), may be so employed as to be capable of keeping ground that has been once put into a proper tilth, always in high order, without the necessity of recurring to those frequent fallows which Tarello recommends: green crops, and legumes of various sorts, which may be successfully reared for producing variety and abundance of food for beasts, while they are at the same time tending to meliorate the soil, of which none but clover are mentioned in this place: fossile manures, particularly of the calcareous sorts, which under judicious management may, on innumerable occasions, form

the bases of great and everlasting improvements; and water as a manure for corn land, the knowledge of which is, even in our day, but in its earliest infancy (it not being then at all known, as I have reason to believe, even in Wiltshire, where irrigation is perhaps more practised than in any other county in England); all of which, and some others, particularly drilled crops under the various modifications that it admits of, might be incorporated with his system with effects the most strikingly beneficial.

In order to impress the mind of the reader with some notion of the importance of attending to these principles, I shall here state a few facts that my own experience hath enabled me to discover; and although some of them may appear to many to verge upon the improbable, yet I scruple not to mark them down as truths that the experience of future times, if not of the present day, will undoubtedly confirm.

It was once a universal practice in Britain, and is still in many parts of the island too rigidly adhered to, to keep a certain portion of the land continually in grass, and another portion of it continually in corn; in consequence of which, neither the one nor the other of these classes of fields could be made to attain that degree of perfection of which they were naturally susceptible: it was my fortune pretty early in life to obtain possession of a farm in that state. A very short experience convinced me, that the ground was misapplied. The corn-land, full of the roots of perennial and seeds of annual weeds, required a peculiarity of seasons that but very seldom occurred, to enable it to produce a very moderate crop; and in some kinds of seasons the crop could not pay nearly the expence of

labouring : nor had the stalks, in any year, that degree of firmness which was capable of nourishing a healthy ear ; being perpetually liable to specks, and blighted grain, so as always to deteriorate the crop. On an average of years, I do not suppose that the barley crops upon those fields amounted to more than twelve bushels per acre, and other crops in proportion : yet after a proper and *thorough* dressing of that land, and laying it down to grass, it yielded crops of hay which were so abundant as far to exceed my own expectation, and to appear perfectly astonishing to others. The crop in one season was indeed so extremely luxuriant, and so much more weighty than any I had ever before seen, that having continued very dry weather, so as to prevent it from being rotted at the bottom, I was enabled to let a part of it stand till it attained that kind of maturity which I conceived might be deemed sufficient to render it a *maximum* crop as to quantity. To ascertain what might be the amount of that *maximum*, I caused a quarter of an acre of the best of it to be measured off, and cut and saved by itself. After the hay was completely made, and fit to keep in any situation, it was weighed : the result was, that the produce was at the rate of more than six tons (say loads) per acre at one cutting. Any one who is acquainted with the usual produce of hay-fields can estimate the proportional amount of that crop. It is necessary to state, that this was the Scotch acre, which is to the English acre in the proportion of five to four nearly ; and that the principal part of the crop was rye grass. I may add, that the grass grew to a length that I never saw either before or since that time, some stalks of it having measured no less than six feet two

inches in length. I scarcely need say, that the hay on that patch which was allowed to stand longer than the rest of the field, was not of the finest quality, having in some measure the firmness and length of thatch : nor do I think I could undertake to rear such a crop again ; for a peculiar concurrence of season is absolutely necessary, and I mention it here merely as a *possible* case. But on *all* occasions the hay and grass crops on this land, thus managed, were *singularly* abundant : and after a moderate time, when the ground was turned up for corn again, the corn crops were as good as could ever be wished ; and the ground may be kept so for ever, by a proper succession from grass to corn, and a judicious alternation and skilful management of cultivated crops.

With regard to the *grass* land on the same farm, the produce from it was at least equally poor with that of the corn crops, and could not have yielded to any man a rent of more than half a crown an acre. Hay was altogether out of the question. That land however, when turned up for corn, ploughed till it was brought into proper tilth, and properly manured, yielded crops of corn not less abundant than the grass crops on the other parts of the farm : and this ground, by a proper change from grass to corn, and a judicious alternation of cultivated crops, might have been kept in a state of perpetually increasing fertility, without any other manures than what were produced by the forage arising from these crops themselves when judiciously consumed, and properly applied. No art, in so far as I can judge, could ever, without the assistance of laying it into grass, have made the corn part pro-

duce good crops of corn ; nor do I believe that the grass land could ever, under any other system of management, have been made to produce such crops of grass as it afterwards did, without having been previously brought into tillage, and continued so for a certain period of years : although it must be observed, that while it is under that course of corn crops it yields a much greater produce than the *richer* corn lands could have done. Thus may fields, which under the old system could never have yielded any other than very poor crops both of grass and corn, be at once, and with scarcely any extra expence, made to yield most luxuriant crops both of grass and corn, and put into a state of advancing in a continued progression of productiveness from year to year. How many millions of acres are there in Britain, which, in consequence of being continued for too great a length of time under the same kind of crops, are not yielding at this moment one-fourth part, to speak in the most moderate terms, of what ought to be their real produce !

I ought however to add, that besides the tillage, the fields to which I allude received *at once* a dressing equal to from 6 to 800 bushels of lime, and 60 double cart-loads of dung (that is, each cart-load as much as two horses can draw upon the ground) per acre. I do not suppose, that, had the same quantity of manure been applied at many different times, it could have had a perceptible effect in producing a permanent melioration of the soil. So much in confirmation of the principles of Camillo Tarello.

To the Editor of Recreations in Agriculture, &c.

SIR,

January 9, 1801.

PLEASED, and almost convinced, by the confident manner in which your correspondent from Manchester has expressed himself in his letter inserted in your last Number, respecting the growth of potatoes from shoots, and not having perused with the requisite attention the observations which follow that communication, I mentioned the circumstances to a gentleman of much information and practical skill in horticultural pursuits, as a subject of great importance on account of its certain tendency to produce a very great reduction in the usual consumption of that valuable root, and consequently to leave a much greater quantity for human food that can now be obtained; a consideration at all times of much moment, but more particularly so at the present period, when the inhabitants of this otherwise highly flourishing kingdom experience a scarcity, artificial or real, of the most necessary articles of sustenance in a very alarming degree. This gentleman, however, informed me, that some years ago, when he resided in the northern part of Yorkshire, he had been told of a similar circumstance; and not giving implicit credit to the account, but convinced of its utility if practicable, he was induced, in order to satisfy himself of its being correct, to try an experiment almost in the same manner, but not to the extent mentioned in your observations, viz. by placing in one row at regular distances from each other potatoes of different sizes, whole and cut, leaving more eyes in some than in others, and also various strong shoots

collected from a heap of potatoes ; and the result, when they were taken up, was found to be beyond comparison in favour of the largest potatoes, and so almost progressively according to the size of the setting : and though he was not so accurate as to weigh or to count the number at each root, yet he found that the experiment had so completely failed with regard to the production of the shoots, that he never afterwards thought of pursuing that method.

I am doubtful whether you will think the preceding circumstance worthy of attention ; but as I have often heard similar assertions made with the utmost confidence, I deem it necessary, as the best, and indeed the only manner of preventing any one from wasting his time and labour in experiments to prove their fallacy or truth, to state what (to use an unfortunately celebrated phrase) experience and the evidence of facts have already shewn ; and which, joined to what you have stated, is, in my opinion, full and sufficient proof that no benefit is to be derived, but on the contrary absolute loss and disappointment, from varying the accustomed and approved method of setting potatoes. Upon a further consideration of your correspondent's letter, and giving him every credit for his assertions as to that particular instance, it does appear to me, that even if it were proved to demonstration, that the produce from shoots was equal to that from whole potatoes, it would not be of such general utility as might be at first sight reasonably supposed. It is, I believe, very well known to every one, that the shoots from potatoes under ground, and indeed in any other situation, are of so brittle a nature as to be very easily bro-

ken and destroyed; and that in planting large fields it would be necessary to have great quantities of them mixed together, and also to have them carried sometimes to a considerable distance in carts and other rough conveyances; it therefore consequently follows, that many of the shoots, in such carriage, must inevitably be destroyed. And even after they have arrived at the place of their destination, they have still to undergo the carelessness and inattention of servants and labourers, who, feeling no interest in the success of the crop, and knowing that their services are judged of from the quantity of work they can perform, are not very anxious that none but proper ones should be put into the ground. Hence, therefore, great inequalities must arise; and losses, which no circumspection could prevent, would unavoidably ensue. If even all these difficulties could be overcome, it yet seems to me more than problematical, whether sufficient quantities of these shoots could be obtained to make the improvement extensively useful, or of any essential benefit. On the whole, therefore, sir, I think it must be concluded, that in respect to this instance your correspondent, influenced no doubt by motives of benevolence, and a desire for the public good, has ventured to draw a general conclusion, without having sufficiently considered the premises on which it was founded.

Permit me, sir, as one of the constant readers of your work, to return you most sincerely the good wishes with which the last Number of it is concluded. We have indeed fallen upon "evil days and evil times," when to speak plainly is to be thought disaffected; and to utter truths which no one can controvert

is considered as the rankest Jacobinism ; when even you, Mr. Editor, than whom no man is apparently actuated by purer motives, cannot entirely escape abuse. That a salutary change may speedily take place, is the wish of, sir, your humble servant, S. H.

MISCELLANEOUS LITERATURE.

On the French System of Weights and Measures.

It has, for some time past, been so unusual to meet with any particulars respecting France that have not been greatly exaggerated on one side or the other, that a person who does not wish to take any part in political disputes, feels himself disposed to lay aside every performance that seems to have a relation to the present state of that country ; though there are doubtless many particulars respecting it that would prove highly interesting to such an inquirer, could he rely upon getting them fairly represented to him. The only information of that kind that I have been able hitherto to obtain is conveyed in a recent small publication by Professor Byggé of Copenhagen, who not long ago visited Paris in search of physical knowledge, and who seems to have pursued his inquiry with a spirit purely philosophical, setting all political and party considerations entirely out of view. His book contains statements that will prove particularly interesting to every person who is sincerely desirous of ascertaining, by

the test of facts, how far speculative perfection is capable of being attained in practice among men in the common concerns of life, and what are the consequences of such an attempt.

It is well known, that the distinctive characteristic of the French revolution was innovation. Every thing was to be changed; and these changes were effected, not by an appeal to the experience of mankind in former times, but on a prospect of ideal refinements, that literary men in their closets had conceived would exalt the state of mankind to a degree of perfection that it had never before attained. It was on *physical possibilities* that they founded their system of reform, rather than *moral probabilities*, on which all other reformers had proceeded. The attempt was so new, and the consequences that would result from it so doubtful in the eyes of considerate men, that most persons of that turn of mind have looked forward with anxiety to the time when public tranquillity shall be restored, that they might then be enabled to investigate with coolness and precision the effects of these changes on the common affairs of life. This is a pleasure of which we have been hitherto deprived; and how long we may be subjected to the same kind of mortification no one can pretend to say. In the mean while the performance of Professor Byggé tends to throw light on a few particulars, that will serve to give some idea of what will be the case with regard to many others that are not mentioned by him.

The subject that we shall select for the entertainment of our readers is that which respects weights and measures; concerning which it appears, that Professor

Byggé, from the course of his previous studies, was well qualified to judge.

After having shewn the great inconvenience that resulted from the extreme variety of weights and measures that prevailed formerly in France, and which was such that it suffered a remarkable difference not only between province and province, but even between town and town, Mr. B. gives due credit to the government for having attempted to establish an equality of weights and measures over the whole extent of the republic; but he does not bestow the like unqualified applause upon the measures that were adopted by those to whom the regulating of this great concern was entrusted; as he thinks that the reform ought to have been conducted upon principles very different from those that were adopted for that purpose.

“ The easiest, the simplest, and the least expensive way (he says) to fulfil such an important object would have been, without doubt, to assume as the basis for the measures of length the French foot (*pied de roi*), the use of which was universal over the whole of France, and whose relation to the measures of other countries has been ascertained with the most exact precision. For weight they might take the *marc*, which is much used everywhere, and is very well known in commerce. For liquid measures, they might in like manner have taken the *Paris pint*, which, by the statute, ought to contain forty-eight cubic inches. As to dry goods, the *bushel* of Paris might have been adopted, which would have preserved the denominations established by long usage, and perfectly familiar to the people, such as *minots*, *septiers*, *muids*, &c.; a procedure so

much the more desirable, as the foot of France and the marc weight have been employed in an infinite number of mathematical, physical, and chemical operations, &c. and in a multitude of works both of France and other nations. It would have been neither difficult nor expensive to cause models to be made of these weights and measures, and to have sent them to different departments, enforcing the general use of them.

“ But this idea appeared too simple. They wished not only to procure for France an equality of weights and measures, but to take the basis of it from nature itself. They were ambitious of introducing it into all nations, and of giving to the whole globe the same weights and measures. They also entertained the hope that the weights and measures never could be lost, or, at least, that they might be re-established, if the models chanced to be destroyed by fire, inundations, earthquakes, or through the lapse of time, which destroys every thing.

“ *Borda*, whose ingenuity is well known, was no doubt the contriver of the new system of weights and measures. I have told him several times, that I was astonished that he had not taken the simple pendulum under the latitude of 45° as the unit for measures of length, this basis being easy to find, and equally susceptible of being fixed with exactness, as that which they have adopted. He replied, that it was not proper to employ it, because the length of it could not be ascertained, without having regard to time; and that time, or at least its divisions, are arbitrary. But ought not time and its divisions to be

considered as an object fixed and unalterable in nature, as long as this globe shall continue to turn upon its axis with a movement equal and always the same?

“ The *metre* is the base of the new metrical system of France; that is, the ten millionth part of the arch of the meridian from the equator to the pole. The length of a degree of the meridian under the latitude 45° has been measured; all then depends upon the exactitude with which that measurement has been made: but the imperfection of our mechanical instruments, conjoined with the weakness of our organs, the greater or less serenity of the atmosphere, the difficulty of distinguishing signals, and several other obstacles to which the most able astronomer, who makes use of the most perfect instruments, is exposed, reduces him to the necessity of rectifying them in an arbitrary manner. In employing the very best instruments, it is possible that an error of one toise in ten millions may take place. This objection is founded, not only on theoretical reasoning, but on long and ascertained experience in trigonometrical mensuration. Consult on this subject my *Description of the method of mensuration employed for the construction of geographical charts in Denmark*. (This was published in the Danish language.)

“ Farther, the instruments that they employed in France, not being of the ultimate exactitude, I am authorised to consider the error with regard to the present object as still more considerable; but even if it were not so, it is always a difference of a twentieth part of a line nearly for the *metre*; and this is assuredly a considerable object. But I am persuaded, that after

the dimensions of the meridian, which, in conformity with the decrees of 1st August 1793 and 7th of April 1795 (or the 18th Germinal 3d year) have been taken for the basis of the *metre*, the difference will amount even to double that, or to the tenth of a line."

[The author proves this last assertion by remarking upon the incertitude of the dimensions traced by Cassini and la Caille, described in *La meridienne de l'observatoire royal de Paris verifiée dans tout l'étendue du royaume par de nouvelles observations par M. Cassini de Thury, à Paris 1744.*]

"The degrees towards the north ought to be larger than the others; nevertheless, in spite of all the care and attention that they had bestowed upon it, it was found, that a degree under the latitude of $43^{\circ} 31'$ was 57,048 toises, and under $45^{\circ} 43'$ only 57,040 by one measurement, and 57,050 by another. This difference of ten toises proves clearly that I have not exaggerated when I supposed that it was possible, and even inevitable, to commit an error of six toises in one degree only.

"We thus see, that those accurate astronomers Cassini and la Caille have not been able to attain the truth by one toise nearly in 10,000; and I much doubt whether any one can approach nearer to it: after these dimensions the *metre* ought to be 3.0807 feet of France. If, by the decree of 18 Germinal 3d year, it was fixed at 3.0794 of these feet, they have rested this upon the meridian traced in Peru by M. Bouger, and of the elevation of the globe under the equator estimated at one-hundred-thirtieths of its axis. But who is not here struck with these arbitrary hypotheses, and the

difference that exists between these two *metres*; of which the one, perhaps as probable as the other, is nevertheless a tenth of a line larger? In my opinion, the length of the metre is subjected to a still greater uncertainty than the length of a simple pendulum under a given latitude; and they ought not, therefore, to be permitted to affirm, that the length of the *mètre* “is just, certain, and established in nature itself.”

“They have farther supposed, that the curvature of the arch of the meridian from the equator to the pole forms a perfect ellipsis; but this too is merely an hypothesis; for the degrees of the meridian, measured by Beccaria of Turin, by Liesganig in Hungary and Austria, and by la Caille on the coast of Africa, seem to prove, that the curvature of the arch is not a perfect and regular ellipsis. In this state of things, there is no *sure* mean of calculating the meridian of the globe from the measurement of some degrees only, and of founding thereupon the base of the *mètre*.

“According to the new French system, every thing respecting the lesser divisions is to be made by tens or hundreds. It is indisputable, that this procedure affords great facilities respecting calculations; but at the same time one may be allowed to doubt whether this method be the most exact when it regards mechanical practices. I am of opinion, that the divisions into $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$ th, &c. can be effected with infinitely more exactness than those which are made by tens. These last are an endless school for patience to the makers of instruments. It is a fact in practical mechanics, that it is impossible to make the divisions by tens or by hundreds with the same precision as those by twos,

This truth is manifested principally in the construction of sextants, quadrants, theodolites, graphometers, &c.

“ If the new metrical system should ever come to be adopted universally, which presents an infinity of local difficulties, all scientific relations between our predecessors and successors would be destroyed. Let us figure to ourselves our great-grandchildren employing the new republican calendar, as well as the instruments and tables divided into 100 degrees, and dividing the day into ten hours. Should they read the astronomical, geographical, and nautical observations of times past, I see them obliged, in order to comprehend these observations, to translate our language into their idiom at each time, and continually occupied in bringing to their aid the ancient divisions of time and space. Fatigued with these eternal calculations, and perpetual reductions, they would reject at once all these superannuated performances; and the fruit of all the labours and researches of our ancestors would be lost to them. It would be the same in regard to works in physics and chemistry, wherever any thing occurred in which weights or measures were concerned. Here then we meet with a serious obstruction, a powerful obstacle to the progress of arts and sciences; for the perfection of astronomy, geography, and hydrography, is founded upon the result of comparisons of observations, and experiments, ancient and modern.

“ Conformably to the new metrical system, the day ought to be divided into ten hours, the hours into a hundred minutes, the minutes into a hundred seconds.

“ The two most able watch-makers, Berthoud and Breguet, and some others, made representations to the directory in Paris, in the name of themselves and their brethren of Paris, stating the great inconveniencies which would result from that division of time, and the loss in particular to which it would subject those of their profession. The effect of their remonstrances has been, to obtain from government a permission to defer this innovation. I have only seen at Paris two clocks constructed upon these principles; one very large, placed in the middle of the garden front of the Thuilleries, attracts notice as an object of curiosity, and a new mode; the other is properly a chronometer made by Berthoud, which has continued to go for fifteen months very regularly.

“ As to the republican calendar, equal difficulties occur with regard to the epoch when the French year commences, which ought to be the day when, according to astronomical calculations, the sun enters upon the first point of the sign *Libra*; but the sun does not enter it every year, either upon the same day, or the same hour. Its passage into that sign of the zodiac is not attached to any precise, fixed, and invariable time. Thus, then, the republican year is equally subject to variations, and is equally difficult to determine as it has been in times past. According to the calendar of all civilized European nations, consecrated by the use and esteem of the greatest legislators and astronomers, we can, by the aid of an easy intercalation, fix the computation of time for several years as well past as to come: a calculation that only comes to differ one entire day from the true astronomical calcu-

lation in 3200 years. It is only after very mature reflection that one ought to be permitted to abandon a chronological system of a simplicity and facility so admirable, and an exactitude so rigorous.

“ The names adopted in this new system, such as *mètre*, *are*, *stère*, *litre*, and *gramme*, will be for a long time barbarous words to the ear of the people, which they will find it difficult to remember : they will not have a less difficulty in comprehending, that *deci*, *centi*, and *milli*, denote partitions of ten, a hundred, or a thousand ; and that *deca*, *hecto*, *kilo*, and *myria*, enounce multiplication by ten, a hundred, a thousand, and ten thousand. In consequence of this, whatever pains the directory have taken to introduce this new system, whatever expence they have incurred in multiplying models in the departments, I should not hesitate to affirm, that its use is confined almost to Paris alone. Beyond that commune, scarcely any others than the public functionaries employ it ; and the greatest part of them only make use of it when it is formally prescribed to them. The majority of the numerous inhabitants of France do not know these names, much less comprehend them ; they continue to make use of their ancient weights and measures ; and it would require several ages, in all probability, before the new could be generally substituted in their place.”

Every person who reads these observations must feel their force, and acknowledge their justness ; and they furnish unanswerable reasons for rejecting in practice every reform in matters of this sort, wherein the interests of every individual are implicated, and which tends

so radically to derange any universally received system of things. But when Mr. De Borda had determined to disregard all those obvious considerations that must affect persons of common sense, it seems to be not a little wonderful that he did not carry his idea of refinement so far as to devise a less exceptionable division than that of the *decimal* which he has adopted; for, doubtless, the *octal* division, if I may adopt a new word, would have been in innumerable respects more convenient, and would have still more facilitated every kind of computation than the decimal. Mr. Byggé justly observes, that the division into halves, quarters, and so on, dividing every subdivision into equal parts, is the most convenient for common use; and it is in fact adopted in practice even where the unit does not admit of such divisions according to our usual standards. Thus, the yard is divided into halves, quarters, eighths, &c. though we cannot thus reduce it into any authorised subdivisions of the yard, such as feet and inches, without fractions. The same thing may be said of inches, hundred weights, hogsheads, and many other weights and measures. In some other cases they are divided regularly in that way, as the pound, and gallon; though the lesser divisions of these do not preserve that kind of proportional division which all the world are evidently so desirous to have universally established.

Having observed the perpetual tendency in all mankind to adopt this subdivision into two universally, I was, a great many years ago, much struck with the circumstance, that no nation had ever thought of adopting the *octal* mode of numeration, by which I mean, that of renewing the account at every *eight*

instead of *ten* (or the decimal), as we now do, which, in as far as I have been able to discover, has been invariably adopted by all nations; for I have never yet met with a language that did not carry on their numeration in a regular series either to five or ten; at which number the series was broke off, and a second series of ten begun; and so on, as among ourselves. The universality of this mode of numeration can be referred to no other source than the number of our fingers, which have been invariably adopted as indices of the series, which could go thus far, but no farther. Those who invented the Arabic characters for notation (which is the most simple, and perhaps the most beautiful exertion of the human mind), have been obviously induced, from the same cause, to adopt the same mode of notation: but if they had adopted the *octal*; that is, had carried one to the next line at every *eight* instead of every *ten*, and had thus counted by *octads* instead of *decads*, our arithmetical operations would have been rendered still more easy than even that which we now use: and had the subdivisions of all other weights and measures been conducted on the same plan, our calculations would in most cases have been infinitely facilitated, as I shall endeavour briefly to show, by specifying a few prominent particulars only, without entering into the minutiae that a serious proposal of carrying such a plan into actual practice would have demanded.

In that case our arithmetical figures would have been reduced to seven digits (instead of nine, as at present) and a zero; and the same numbers would have been denoted by the different notations, as hereafter stated.

For the sake of oral expression, it might be very easy to contrive words, analogically formed, that might ascend to any number with more distinctness than at present; but into this particular it would be very unnecessary to enter at present. The numbers regularly arrange themselves into different series of *eights*, in the same manner as they now do into *tens*. The first series below is marked according to our present notation, the second series by the *octal* mode.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,
 1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23,
 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36,
 24, 25, 26, 27, 30, 31, 32, 33, 34, 35, 36, 37, 40, 41, 42, 43, 44,
 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55,
 45, 46, 47, 50, 51, 52, 53, 54, 55, 56, 57, 60, 61, 62, 63, 64, 65, 66, 67,
 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72,
 70, 71, 72, 73, 74, 75, 76, 77, 100, 101, 102, 103, 104, 105, 106, 107, 108.

After the same method the numeration may be carried on as far as shall be thought convenient. The reader will have no difficulty in comprehending the meaning of all this very distinctly, though from the want of the proper nomenclature he will be at a loss to read them to himself or others. This difficulty could be easily obviated were it judged necessary.

This mode of notation, it is obvious, would have all the advantages that the Arabic numerals so eminently possess, for every arithmetical operation; all of which should be carried on after the same manner; with this difference only, of carrying forward at every *eight* instead of *ten*, as the following examples will fully show; both which examples denote precisely the same numbers; that on the left hand being placed according to the common, or decimal, and that to the right by the

octal notation. The figures at the side are super-numerary.

First Example.		Second Example.	
decimal.	octal.	decimal.	octal.
1	1	2 1 3. 5.	4 3 2. 1
2	2	1. 0 6 3	1 0 6 5.
3. 2.	3. 0	8 4 0 8.	3. 2 0 4
4	4	6. 2 3. 1	6 1 3. 0
5	5. 1	4 0 0 2	1. 0 2 0
6. 0.	6. 4	1 0 6 1	6 7. 3 2
7. 4.	7. 6		
8. 7.	10	<hr/>	<hr/>
9	11	2 9 0 0	6 7 1 4
10	12		
20	24		
<hr/>	<hr/>		
75	113		

In the first example, for the sake of illustration, I have placed a dot at the right hand of each of the figures where the numbers in summing up amount to ten. If there be any over ten, that overplus is placed at the right hand side, and is added to the next number above, and so on; thus: nine and eight make 17, which is ten and seven over. The dot stands for the ten, and the 7 is placed to the right hand of it, and the 7 comes to be added to the figure above, which being 7, make 14; of course this makes a dot and 4 over: and so on upwards, as is in common practised in teaching beginners in arithmetic.

In the second, or octal column, the same process is observed, only making the dot at 8 instead of 10. Thus 4 and 2 make 6, and 1 is 7, and 7 is 14, which is 8 and 6 over; a dot is put for the 8, and the 6 is carried forward. 6 and 6 make 12, which is 8 and 4 over; a dot here, and 4 carried to 5 make 9, which is 1 over 8; one and 4 is 5, and 3 is 8; which is a dot and 0 over; two and 1 make 3, which is placed at the bottom. There being here 4 dots, these are counted 4 in the next line, which added to 2 make 6, and 1 and

1 is 8, dot and 1 over, which mark below, and the dot brought down makes 113: no farther illustration is here required. The second example is but a repetition of the same procedure.

It is plain, that by a little practice, after being familiar with the numeration table, all operations in addition and subtraction would be equally easy as in common arithmetic: and the same may be said of multiplication and division after the multiplication table was learned, which would be less burdensome to the memory than our common multiplication table, because it is shorter. It would stand as below; but you will please to observe, that the undermost range of figures only in each square denote the *octal* table, those above being the *decimal* table now in use; merely to show how the corresponding numbers should be respectively marked.

The multiplication table according to the octal system of Arithmetic.

1 1	2	3	4	5	6	7	8 10
2	4 4	6 6	8 10	10 12	12 14	14 16	16 20
3	6 6	9 11	12 14	15 17	18 22	21 25	24 30
4	8 10	12 14	16 20	20 24	24 30	28 34	32 40
5	10 12	15 17	20 24	25 31	30 36	35 43	40 50
6	12 14	18 22	24 30	30 36	36 44	42 52	48 60
7	14 16	21 25	28 34	35 43	42 52	49 61	56 70
8 10	16 20	24 30	32 40	40 50	48 60	56 70	64 100

I shall not stop to make any farther application of this table, than just to remark, that, were this system of

arithmetic adopted, it would be easy, by a very few rules, to form the square and cube of numbers in most cases by inspection, because they naturally fall into the lines of unity, as will be shown by the following examples, where the squares and cubes are formed by the *decimal* and by the *octal* method.

Decimal.	Octal.	Decimal.	Octal.
2	2	4	4
2	2	4	4
—	—	—	—
4 squ.	4 squ.	16 squ.	20 squ.
2	2	4	4
—	—	—	—
8 cube.	10 cube.	64 cube.	100 cube.

Thus much may suffice for giving a glimpse at the *octal* system of arithmetic. Let us now view it in its application to weights and measures.

For measures of length, let us suppose that the yard were assumed as the unit, and that all the divisions and multiples of it went on in the ratio of 8 to one, each of which might admit of being divided and subdivided as under. The smallest division might be called a hairbreadth, the multiples of which, with their subdivisions, might assume the following, or other more suitable names :

8 hairbreadths make	1 barleycorn,	$\frac{1}{8}$ of which strawbreadth,	$\frac{1}{8}$ do. no name.
8 barleycorns make	1 span	1 span a nail.	1 span, an inch.
8 spans make	1 yard	1 yard a cubit	1 yard a foot.
8 yards make	1 rod.	1 do. no name.	1 do. no name.
8 rods make	1 furlong	1 do. no name.	1 do. no name.
8 furlongs make	1 mile	1 do. no name.	1 do. no name.

Were the yard to be made the length of a pendulum vibrating seconds in latitude 45° , it would be, of our present inches and decimals, 39.2 nearly ; at which rate the respective measures would be of the lengths indicated in the following statement, viz.

Yards of the present standard.

- 1 mile . 4608 ; precisely 32 yards less than our present mile.
 1 furlong 576 ; being just 4 yards less than the present furlong.
 1 line . . . 72 ; we have no measure of this description at present.
 1 pole 9 ; double the size of our present pole.

Inches.

- 1 yard 39.2 ; larger than our present yard 3.2 inches : $\frac{1}{2}$ yard
 or cubit 19.6 inches, $\frac{1}{4}$ yard or foot 9 8 do.
 1 span 4.9 $\frac{1}{2}$ do. or nail 2.45. $\frac{1}{4}$ do. or inch 1.275.
 1 barleycorn . . 0.6375. $\frac{1}{2}$ do. strawbreadth 0.318. $\frac{1}{4}$ do. no name 0.159.
 1 hairbreadth . 0.0799.

And these respective measures, when written down according to the octal mode of notation, would be marked thus :

	Mile.	Furlong.	Line.	Pole.	Yard.	Span.	Barleycorn.	Hairbreadth.	
	1	1	1	1	1	1	1	1	
A BARLEYCORN							.0 1 0		A barleycorn.
							.0 0 4		Half a barleycorn. (<i>Strawbreadth</i>).
							.0 0 2		One fourth (no name).
A SPAN1 0 0			
						.0 4 0			Half a span (a <i>nail</i>).
						.0 2 0			One fourth span (an <i>inch</i>).
A YARD					1.0 0 0				
					.4 0 0				Half a yard (a <i>cubit</i>).
					.2 0 0				One fourth yard (a <i>foot</i>).
A POLE				1 0.0 0 0					
				4.0 0 0					Half a pole (no name).
				2.0 0 0					A quarter ditto (no name).
A LINE		1 0 0.0 0 0							
		4 0.0 0 0							Half a line (no name).
		2 0.0 0 0							A quarter ditto (no name).
A FURLONG . . .	1 0 0 0.0 0 0								
	4 0 0.0 0 0								Half a furlong (no name).
	2 0 0.0 0 0								A quarter furlong (no name).
A MILE	1 0 0 0.0 0 0								
	4 0 0 0.0 0 0								Half a mile (four furlongs, no name).
	2 0 0 0.0 0 0								A quarter mile (2 furlongs, no name).

Let us now try the same mode of subdivision respecting measures of capacity for liquids ; and by taking the present gallon as the basis, which contains 282 cubic inches, they might be made to ascend in a progression like what follows :

8 drops make	1 dram . . .	$\frac{1}{2}$ do. no name	$\frac{1}{4}$ do. no name.
8 drams make . . .	1 gill	$\frac{1}{2}$ do. no name	$\frac{1}{4}$ do. no name.
8 gills make	1 pint	$\frac{1}{2}$ do. no name	$\frac{1}{4}$ do. a quartern.
8 pints make	1 gallon . . .	$\frac{1}{2}$ do. no name	$\frac{1}{4}$ do. a quart.
8 gallons make . . .	1 firkin . . .	$\frac{1}{2}$ do. a keg . .	$\frac{1}{4}$ do. a flagon.
8 firkins make . . .	1 hogshead .	$\frac{1}{2}$ do. no name	$\frac{1}{4}$ do. no name.
8 hogsheads make .	1 butt	$\frac{1}{2}$ do. a tun . .	$\frac{1}{4}$ do. a pipe.

It deserves to be remarked, that, according to this arrangement, all the received measures now in use would be continued with scarcely any alteration. The *quartern*, *pint*, *quart*, *gallon*, *firkin*, *pipe*, and *tun*, remain without the smallest variation; and the *hogshead* would only vary from its present size by one pint, as it would contain 64 instead of 63 pints, as at present. The *butt* only, which is now equal with the *pipe*, has its place changed.

These measures, when marked numerically by the *octal* mode, would stand thus: the measures would be respectively thus denoted:

	Butt.	Hogshead.	Firkins.	Gallons.	Pints.	Gills.	Drams.	Drops.	Hogshead.	Gallons.	Pints.		
A BUTT	1	0	0	0	0	0	0	0	= 8 =	512	= 4096		
A tun	4	0	0	0	0	0	0	0	= 4 =	256	= 2048		
A pipe	2	0	0	0	0	0	0	0	= 2 =	128	= 1024		
A HOGSHEAD	1	0	0	0	0	0	0	0	= 1 =	64	= 512		
$\frac{1}{2}$ hogshead		4	0	0	0	0	0	0	= 0 =	32	= 256		
$\frac{1}{4}$ hogshead		2	0	0	0	0	0	0	= 0 =	16	= 128		
A FIRKIN		1	0	0	0	0	0	0	= 0 =	8	= 64		
$\frac{1}{2}$ do. a keg			4	0	0	0	0	0	= 0 =	4	= 32		
$\frac{1}{4}$ do. a flagon			2	0	0	0	0	0	= 0 =	2	= 16		
A GALLON			1	0	0	0	0	0	= 0 =	1	= 8	= 282	
$\frac{1}{2}$ gallon			0	4	0	0	0	0	= 0 =	0	= 1	= 141	
$\frac{1}{4}$ do. a quart			0	2	0	0	0	0	= 0 =	0	= 0	= 70.5	
A PINT			0	1	0	0	0	0	= 0 =	0	= 0	= 35.25	
$\frac{1}{2}$ do.			0	0	4	0	0	0	= 0 =	0	= 0	= 17.625	
$\frac{1}{4}$ do. a quartern			0	0	2	0	0	0	= 0 =	0	= 0	= 8.8125	
A GILL			0	0	1	0	0	0	= 0 =	0	= 0	= 4.40625	
$\frac{1}{2}$ do.			0	0	0	4	0	0	= 0 =	0	= 0	= 2.20312	
$\frac{1}{4}$ do.			0	0	0	2	0	0	= 0 =	0	= 0	= 1.10156	
A DRAM			0	0	0	0	1	0	= 0 =	0	= 0	= 0.55078	
A DROP			0	0	0	0	0	1	= 0 =	0	= 0	= 0.06884	

I shall proceed no farther in this kind of illustration, than merely to try how our coins and monies might be arranged according to the *octal* system, in order to show the multiplied facilities and harmonies that would result from the arrangement.

In the view of departing as little as possible from the present established modes, we shall suppose that the real pound of silver were assumed as the unit, as it originally was over all Europe, and that it were still to be called a pound. The pound of silver in Great Britain is now coined into 62 shillings. By coining it into 64 shillings, this shilling would be so nearly of the same value as at present as to make no sensible difference, and it would be reduced at once to the octal system. The pound then being placed as the unit, the shilling would be marked thus o. 01. The shilling might be a silver coin, with its half ditto of silver also. The pound would be a convenient gold coin, with its halves and quarters of gold also. The lower coins might be of copper. They might be arranged as under, and the respective value of each in our present coin would be as here exhibited :

Shillings of their present value.

A DOIT equal to	.0188	
8 DOITS make 1 PENNY	.1210	a little more than our present penny.
8 PENNIES make 1 SHILLING.	.9680	a little less than our present shilling.
8 SHILLINGS make 1 MARK	7.7500	a little more than one third of a guinea.
8 MARKS make 1 POUND	64.000	three guineas nearly.

pounds	marks	shillings	pennies	doits
1.	1	1	1	1

Which would stand thus, when put down to account :

I shall now beg leave to make a few remarks upon the benefits that would have resulted from this system of arrangement in the common affairs of life.

In the first place, if any one of these objects is considered by itself, whether that be monies, weights, or measures, the exact relative proportion which any one denomination bears to the other is seen at once by simple inspection.

In the second place, when the value of any one of these parts is expressed in money, the exact value of

any one of these proportional parts is known at once, merely by shifting the point. For example: in regard to measures of capacity for liquids, we have seen that

the multiples stand thus :

Butts.	Hogsheads.	Firkins.	Gallons.	Pints.	Gills.	Drams.	Drops.
o	o	o	o	o	o	o	o

Suppose the price of a hogshead of wine be 25l. what is its value per gallon? I observe, by looking at the table of liquid measures, that the gallon is removed two places to the right hand of the hogshead; of course, by leaving the figures denoting the price as before, and moving the dot two places to the left, the answer is given, 0.25l. By the same rule the gill will be 0.0025l. and the but will be 250l. Nor is the difficulty increased when the price consists of many parts; for example, one gallon costs 0.103l. what is the price of a gill? Answer, 0.00103l. What is the price of a hogshead? Answer, 10.3l. What is the price of a drop? Answer, 0.000103l. Of a butt? 103l. and so on in every case.

Without entering any farther into details, these few illustrations will be sufficient to show, that if this mode of subdividing had been extended universally to all the objects that were susceptible of it, especially to those that are articles of commerce, it would have tended wonderfully to simplify accounts, and to facilitate mercantile transactions and calculations of various kinds. It might besides have been applied to many other cases where it is not so obviously beneficial, with much less inconvenience than the decimal division adopted by the French: such as the mensuration of angles, against which there is no other objection, but the inconvenience arising from an unnecessary change. The

distribution of hours in the day (the natural diurnal space spontaneously, as it were, dividing itself into two parts, night and day, which might consist of 8 hours each); the division of hours into lesser parts; and a variety of other particulars. But as to the reducing the year into any determinate system of this sort, the discrepancy between the number of days, and the periodical revolutions of the planets, is such as to render every attempt totally impracticable; yet even now we divide it into halves and quarters. Fortunately, such innovations, if they could be accomplished, would be of no essential utility. The really useful is certainly, when physically considered, very easily attainable upon this plan; and it is a pity, that when the French philosophers set themselves to disregard every moral consideration, they did not adopt the only plan that was actually attainable. Any person who has a turn for such speculations as the present would find, by pushing his views farther than I choose to do at this time, that they would open a beautiful field for an innocent recreation to the mind.

On Grecian and Gothic Architecture.

[Continued from page 394.]

MUCH has been written about originality and imitation in architecture; and many attempts have been made to show, that the architecture which has been called *Gothic* is not an original invention, but merely an imitation of the *Grecian*. For my own part, I consider it as a matter of very little consequence, whether it be an original invention or not: all that I conceive to be worthy of investigation is, whether it be

really useful, and well suited to the purposes for which it was intended. But, with a view to set aside such trifling discussions in future, I shall in a few lines endeavour to give some sort of definite meaning to those two terms (indefinite as thus used) *originality* and *imitation*.

A gentleman, to whose opinion I pay much deference, thinks that the characteristic feature of genius is *invention*. It may be so; but before we can determine this point we ought to be able to say, with a precise discrimination, what invention is. In considering this question it appears, that invention must mean either the discovery of things that have no prototype in nature, or of things that owe their origin to some object in nature which may have suggested ideas that, under different modifications, may have led to the invention. In the first case, as all reasoning must be founded on facts, and as in that case there can be no facts on which reasoning could be founded, any discoveries that might thus be made never could be derived from mental exertion of any kind, but must be the result of accident alone; and assuredly no one would say, that such discoveries would entitle him who made them to the name of a person of genius; nor could such discoveries themselves be called inventions in the strict meaning of the word; but they must be rather called casualties. The word invention always supposes that an improvement, beyond what was formerly known, has been made, in consequence of some mental exertion, which necessarily supposes the pre-existence of some object or prototype upon which the mind could operate, and so modify it as to produce the un-

expected effect that had been attained. With this limitation of the word, I should have no other objection to the above definition of genius by my friend, than that, in consequence of being indefinite, it has led to that kind of confusion of ideas which gives rise to perpetual disputes. To avoid this, I should rather be inclined to say, that the essential characteristic feature of genius may be called, “the faculty of observing
 “such objects as come within the verge of human
 “cognisance with an accurate discrimination, and of
 “seizing the circumstances which characterise them
 “with promptitude and certainty, so as to make a
 “lasting impression on the memory, where they remain stored up, as it were, like tools, to be ready
 “whenever occasion shall require them to be called
 “into action, and to be separated or combined together, so as to produce striking and unobserved
 “effects, calculated to attain the purpose at which we
 “aim in the most direct manner, and with the happiest facility.” Invention, according to this definition, would be a natural concomitant of genius, and therefore might be admitted as a proof, if you please, that genius did exist. But the faculty may exist without being exercised; so that genius may be allowed to lie dormant without discoveries (which are usually confounded with inventions), as discoveries may be made without genius (invention). In like manner, prototypes may be suffered to pass long unobserved in nature, without being modulated by the power of genius, so as to produce those effects of which they were naturally susceptible, and thus afford unused materials, if you please so to call them, for future inventions, to which no end can possibly be ever assigned.

If we apply this reasoning to the subject in question, we shall be able easily to perceive, that the inventors of the Grecian and the Gothic modes of architecture (as they have been characterised in the preceding parts of these essays) are alike entitled to be called inventors; and that they both proceeded after the same manner to separate and combine together known objects, so as to produce new and striking effects calculated happily to accomplish the purposes they wished to attain. It is plain, that in both cases the hints which set their minds at work were borrowed from objects cognisable by their senses, and that these were so modified by a chain of progressive ratiocination, grounded on the known qualities of bodies, as at last to attain that degree of perfection in art which had not been formerly reached by other men; so that they both alike claim to be styled inventions.

As to the allegation, that the Greeks had used columns as pillars before the Gothic artists did so, and that therefore they may be said to be imitators only, and not inventors; as justly might others allege, that as the stems of trees had existed, and had been used as props long before the Grecian colonnade was devised, therefore the Grecian artists were not entitled to the name of inventors, but imitators only. And by the same mode of reasoning all other inventions might be transformed into mere imitations: but this would be so to confound all language, as to render a free communication of ideas between man and man impracticable.

The difference between an imitator and an inventor I should take to be this: an inventor contrives devices to

effect purposes that either have not been effected at all, or that have not before been effected by means of the same kind; an imitator tries to effect the purposes he aims at by the same means that have been formerly employed, either with as little variation as possible, or with such slight alterations as, without making any essential deviation in point of effect, make some small variation in form or other circumstances. For example, I should consider all the varieties of the Grecian colonnade as reducible to the head of one single invention; because every essential purpose that can be effected by any one of them can be effected in the same manner by the whole; so that, if it could be ascertained which of these was the original, I should call all the others only imitations of it. In like manner I should consider the different varieties of the Gothic architecture as one invention; because they are all adapted to produce similar effects by means that had never before been applied to such purposes; and so on of others. Without detaining the reader longer on this barren branch of the subject, I shall now proceed to make a few concluding remarks on the whole; which will chiefly respect some farther peculiarities affecting the Gothic mode of building, rather as objects of taste than as fundamental principles.

Those who believe, that an inventive genius always proceeds upon the idea that it finally adheres to in the end, would have no difficulty in discovering the prototype, which he would be persuaded had influenced the mind of the Gothic architects in conducting their plan of building. The ribs that branch off on all sides from the top of the columns for the support of the roof

have so much the appearance of the branches springing from the stem of a tree after it has been cut over; they join with the ribs from the other columns, and sometimes intersect each other so much after the same manner as the branches from a contiguous row of trees naturally do and the small prominences at the top of the columns so much resemble the swellings that naturally take place where the branches spring out from the stem of a pollard tree, that it is impossible for any one who adverts to all these particulars, not to perceive at once the striking resemblance that exists between two contiguous rows of Gothic columns with the arched roofs above, and two regular rows of some kinds of pollard trees (the lime-tree for example) similarly placed, after the branches have attained a considerable size, and have intermingled with each other. This idea is strongly corroborated by the projection of the ribs, which was probably adopted as an appropriate ornament, on account of the beauty observed to result from the roundness of the branches of the trees. The smooth part of the roof seen between these ribs, was sometimes, in conformity with this idea, painted of a clear sky-blue; the ribs were of another distinct colour, and on some occasions even the roof was studded with stars, apparently with a view to represent the sky as seen between the branches. These resemblances are all indeed so perfect, that I cannot entertain a doubt that they operated on the mind of the artist when these ornaments were devised. But that this resemblance entered into his conception when he began to devise this mode of building, I do not see the smallest reason to believe. The system of these artists was in

all probability the result of a gradual and slow development of ideas, progressively advancing from some obscure hints, corrected and matured by succeeding experience for a long period of years, somewhat after the manner described in the preceding parts of this essay, till they attained at last their final completion under the elegant and appropriate forms which they now occasionally exhibit; and the particular above stated, was, in all probability, an after-thought only, suggested by the near resemblance that the forms which the structures naturally assumed in their progress to perfection, bore to trees in the circumstances above stated. This particularity of form, therefore, I consider as accidental rather than intended; but, in conformity to the general progress of genius, no sooner would this general resemblance be perceived, than the mind would catch the hint and improve upon it, so as to make it contribute to the elegance and beauty of these structures.

I have already had occasion to remark, that the Gothic artists appear to have paid an uncommon degree of attention, in order to discover every circumstance that had a tendency to render successful their efforts to perfect their structures; and that they readily adopted every hint which fell within their observation to add strength or elegance to the whole, without servilely copying from any one. The specimen that I have just now adduced of their adopting the hint from the divaricating branches of the tree, for the purpose of giving grace and elegance to the roof, is a striking illustration of this particular; and whoever contemplates one of these roofs with attention, under this point of view, will be compelled to acknowledge that they have availed

themselves of it with the happiest effect ; but they did not stop here.

They had observed, no doubt, in examining the variety of trees that grow in our regions, that some sorts occasionally exhibit in the bole a kind of regular inequality of appearance on the surface, consisting of something that assumes the form of a kind of veins running in a direction nearly parallel to one another from the bottom to the top, which gave to the stem an elegant richness of appearance, very different from that bare look which a smooth unvarying surface around the whole of its circumference exhibited ; more especially when these large columns, from the purposes for which they were intended to answer, were of necessity brought at times very near to the eye of the beholder. With that felicity of discrimination, therefore, which so strongly characterises all their contrivances, they instantly adopted this hint, and modelled it for their purpose. To this hint, I have no doubt, we are indebted for those rod-like ribs that so usually serve to peculiarise their columns, and which, without deranging their general symmetry when viewed at a distance (where they are not perceptible), give a richness to the particular parts as you gradually approach them, and a lightness of effect when you are quite near, which have not yet been equalled by any other contrivance that has been adopted by man for similar purposes. The Greeks also, having felt the same defect in their column, had attempted to remedy it by a contrivance in some measure of the same sort, denominated fluting ; though much more clumsy, and, like many other of their secondary devices, much less adapted

to answer the purpose intended, than those to which I now refer; as every person who candidly compares them together will readily recognise. Of the Grecian devices of this sort I shall afterwards have occasion to take notice; in the mean while, I may just remark, that on some occasions, it would seem, the Gothic artists had had in view some parasitic plants running up on the outside of the stem, or rods, and bound to it by bands at different heights; these seem not, however, to have been adopted in the chaster æra of the art, and can be considered only as a vicious refinement of after-times: but I have not met with any instance in which they deviated so far into the fantastic walk, as to make these protuberances assume a writhed or twisted appearance winding round the column. That was a refinement left for after-ages.

The principle which they adopted with regard to the column, was also applied to other parts of their structures with the happiest effect; although this particular, like many of the other beautiful devices of these wonderful artists, has been stigmatised by fastidious ignorance as barbarous absurdities. The principle to which I here allude is, to adorn those large and massy parts of their structure, the effect of whose general symmetry can only be seen at a distance, with ornaments so small, as that, when seen at a distance, they do not catch the eye, nor mar the general effect; but when to be viewed near at hand, where the features of grandeur cannot be recognised, because the general proportions are lost sight of, these smaller ornaments come then to catch the eye, and exhibit a richness of appearance which takes off from the meagre look of these great objects if

left perfectly bare, when viewed near at hand. Had the beholder been limited in his approaches, so as to be able to come only within a certain distance, as is the case with some justly celebrated paintings of antiquity (in which very bold strokes produce, when they are seen at a proper distance, a great and striking effect, although when nearly viewed they appear only coarse and disgusting daubings), our artists might have adopted a similar mode of procedure. But this not being the case, they, observing the operations of nature under similar circumstances, followed her footsteps with fidelity: they observed, that scarcely a stalk of grass was to be found which was not marked by certain rugosities or depressions; that there was not the bark of a tree which was not diversified by means of small protuberances, cracks, and fissures, interspersed by variety of lichens and of small parasitical plants, which, though they were not at all perceptible at a distance, gave to them a rich beauty of effect when near at hand, that they would not otherwise have possessed: they remarked, that when a living creature, for instance, was seen at a distance, his figure only, and not his features, were perceptible; but when he drew near, and intermingled with society, the smaller features became distinguishable; the form and disposition of the hairs; the pulpy softness or characteristic wrinkles of the skin; the varying motions of the muscles, and the expressive keenness of the eye, all concurred to give to life an energy, expression, and interest, that would have been totally lost had they not been defined by delicate touches which could only be seen when near. From these prototypes, then, they borrowed their ideas

of the manner in which ornaments should be adopted in their buildings; and, proceeding on these principles, they have, in imitation of the works of nature, exhibited a diversity in uniformity which we in vain attempt to discover in any other of the works of art. By adverting to these circumstances, many peculiarities of Gothic structures will be rendered intelligible, which have been hitherto deemed singular and unaccountable aberrations. From this view of the subject too, it will be seen how few of their ideas they borrowed from the Grecian artists.

In many of the most perfect Gothic structures it is remarkable, that, although the ranges of columns and other prominent parts appear, on a general view, to be entirely alike, yet when they come to be nearly examined they exhibit an infinite diversity of appearances. The top of one column will exhibit a natural representation of a cauliflower—that of another, clusters of grapes—another, grotesque figures of human beings, or beasts, in a variety of attitudes; and so on round the whole range of natural or ideal existences. It is this which I call diversity in uniformity; for, while the whole is, uniform when viewed at a distance, and when only they can be considered as parts of one object; yet when viewed near, and when every great member comes to be considered as one distinct whole, the reiterated sameness and uniformity of parts becomes disgusting; and that which was meant as an ornament becomes in fact a deformity, from the contemplation of which the mind turns aside with disgust: whereas by the plan that they adopted, that which pleased as a whole when seen at a distance, continues to afford

a new fund of delight when seen near at hand. Like a gallery of paintings, it is not the uniformity of the framing (which, when seen at a distance, is the only observable particular), or the richness of colours continually repeated, that affords delight; but the interest that each separately excites when successively examined, which, by awakening a diversity of varied sensations, keeps the mind alive, and gives energy to its perceptions. Compared with this, how poor is the system of ornament adopted in the Grecian colonnade! In that, every stroke of the chisel is repeated again, and again, and again, with the most disgusting uniformity; so that the mind is palled, and soon sickens at the view. I have often wondered how an idea of this kind should ever have entered into the mind of man, with a view to carry it into execution. Had the columns and their parts been cast in moulds, or impressed with stamps, like our earthen wares, I could have seen a good reason for sacrificing elegance for the sake of diminishing expence; but where the whole was to be executed by the chisel, it appears to me one of the greatest deviations from the dictates of sound sense, and, of course, from the principles of good taste, that has ever been exhibited to the world; and this has been done by a set of men who, in many other respects, carried the arts to a high degree of perfection. If however the inventors themselves did not discover this imperfection in their art, it was scarcely to be expected that their blind imitators (who have so often misapplied it to the basest purposes, where no blame attached to the inventors) could do it; it was not to be expected, that they should dare to think, that any thing concerning the art could in any one respect fall short of sovereign per-

460 *On Grecian and Gothic Architecture.*

fection. Thus did the Egyptians of old fall down and worship the bull which their own hands had consecrated, and exalt into a deity that which was far inferior to man. And what is man, that he should be considered as incapable of deviating into error? The creature of a day, who knows nothing completely! It is degrading to human nature to consider that men should have continued to think, to speak, and to act, upon such a principle for so many ages. Justly might the philosopher, who contemplated these things, cry out with a burst of indignant contempt, *O imitatores, servum pecus!* Of them it might be justly said, "eyes have they, but they see not." Among this degraded herd, however, must not be ranked our Gothic artists. They opened their eyes, and contemplated the works of God; and in all the wide range of this universe not one single prototype that could cherish this idea could be found. Even man, with all his efforts to mould natural objects into uniformity, has not been able to effect it. He can dress a regiment of soldiers exactly in the same uniform, it is true; he can choose them all of one stature: thus far he can go, but no farther. Each individual can still be distinguished by his shape, his proportion, the features of his countenance, the eyes in his forehead, the hairs of his eyebrows; nay, the very sound of his voice, the structure of his hand-writing, and every motion and gesture, impressed on him by the finger of God, are diversified in spite of himself, and mark the individual. The same diversity prevails throughout the whole regions of nature; and perhaps the Grecian colonnade is the only object that exists in this universe, in which, without a cause, man has attempted to deviate from this invariable law of

nature by adhering to a strict uniformity in every minute particular respecting it.

Though I am inclined to ascribe by far the greater part of the incongruities observable in the Grecian style of architecture to the injudicious conduct of blind imitators; yet there are some inelegancies (when compared with Gothic practice), perhaps incongruities, which may be traced back even to the inventors themselves. Of this kind may be ranked the naked smoothness of the shaft of the column itself; which, though when viewed at a distance it is in no respect defective, yet when the column is of a large size and seen near at hand, it appears on that account clumsy and bare. The flutings also are, comparatively speaking, tame and clumsy. Still more objectionable are the half-flutings that are sometimes introduced. The bulging of the column belongs also to this class, as well as the disgusting uniformity so lately objected to. With regard to all these particulars it must be owned, that if the Gothic artists borrowed from the Grecian architecture in any respect, they did it not as imitators, but as most judicious and enlightened improvers: yet I see very little reason to believe, that they considered this style of architecture (if they knew it) as of any superior merit, seeing that they departed from its most striking characteristics in almost every particular.

I am not at present quite clear, that any instance is to be found among the chaster remains of ancient Greece, of the architrave being broken, so as to be made to project over a particular column beyond the general plane of the front. I rather think that the inventors must be freed from the imputation of this striking incongruity; and that this, with many other

defects of the Grecian style of architecture, may be traced to the Romans, who were more remarkable for their military prowess than for their skill in the fine arts. I should suppose, that it was almost a necessary concomitant of the pilaster; for the projection of a few inches is by no means such a violent departure from obvious propriety as that disgusting projection to the depth of a whole column, which must be made where a single column projects; and which appears indeed so shocking to every beholder, that I am inclined to think that our barbarous forefathers, in the earlier period of the dark ages, may claim the merit of introducing it into fashion; at least, the most numerous specimens of it that I know are to be found in monumental structures preserved every where in our cathedrals. It is certain, however, that the Romans did erect monumental columns, in which they adhered to the same principle, by cutting the architrave to pieces, and squaring it all round; thus converting an useful member, which was originally adapted to give strength and stability to the structure, into a useless and incongruous appendage, that by its improper position, and tottering situation, seemed to threaten destruction to all who came near it. This practice however, once introduced, seemed to sanction the idea that a column ought not in any case to be employed without being surmounted by its entablature, however useless it might there be, and however ridiculous it might appear: and when a notion, that has no foundation either in nature or sound sense, once becomes prevalent, no one can say to what degree of absurdity it may be carried; for, having lost

the only real criteria for limitation, we may continue to wander without knowing where we are to stop. Nor could I, perhaps, adduce a more apt illustration of this position than the present case affords.

There is in London a church of most wonderful construction, which has been much celebrated ; and deserves to be so, if the effecting what no other person could have conceived an idea of doing can give a just claim to celebrity : for I do believe, that there never was an equal number of architectural incongruities huddled together in so small a compass as here ; so that I consider it as the *ne plus ultra* in this line. In the church alluded to, we find the Grecian column, though made of wood (not of marble), surmounted by its capital, architrave, and cornice (standing in full pomp, like a Greenwich pensioner with his large cocked hat and bushy periwig), totally detached from all other objects on its own level, surmounted by arches in the Gothic manner, but after the Grecian form and fashion. [Compare with this the graceful springing of the arches from the top of the Gothic pillar ! Go for this purpose to the Temple church, or Westminster Abbey.] These arches, whose very existence ought to depend upon the solidity and weight of the materials of which they consist, are made of chips of wood, instead of stone ; so that, in order to keep them from falling, they must be bound by internal bars of a straight, not a curved form, that are concealed from view by the veneering with which the whole is covered. To proceed farther in this kind of analysis would prove tiresome : I shall, therefore, conclude it by directing the reader to the church of St. Stephen,

Walbrook, where he may have the pleasure of contemplating at leisure this matchless composition: warning him, however, not to let drop any hints of disapprobation, or he will run a risk of being hooted at as a maniac: for there is scarcely any church in England that has obtained higher eulogiums abroad, and from a certain description of persons at home; than this has: nor can it be denied, that it is indeed and in truth a most *wonderful structure*.

The base of a colonnade, like the architrave, is a necessary, and, when of due proportion, a beautiful accompaniment. This, however, depends upon the idea of giving solidity to the column, and stability to the pile. Its very excellence, considered in this point of view, depends upon its continuity. When it is cut off, and squared like the architrave above described, and the pillar placed upon it when thus isolated, it looks like a man upon stilts, and appears to be so tottering and unstable as to give pain, instead of pleasure, to every person who contemplates it: it therefore counteracts the very intention for which it was reared; yet even this fashion, fantastic and absurd as it must be deemed, has been often adopted, and so frequently carried into practice, that my readers can have no difficulty in meeting with examples of it; and with the conclusions they will draw from that contemplation I leave them.

I might proceed farther in the same train; but the task is ungracious and unpleasing. Enough, I presume, has been said, to show, that the idolatrous worship which has been paid to one of the varieties of architecture here characterised, and the indiscriminate

Opprobrium that has been poured forth upon the other, are alike unfounded. Perhaps a time may come, when they may both be viewed with something more of that candid discriminative impartiality with which one man ought ever to view the inventions of another, than has hitherto been the case. When that shall happen, my object in writing these essays will have been attained.

Although *external* appearance seems to have been at all times but a secondary consideration with the Gothic artists, *internal* convenience and effect being ever the first; yet there are not wanting some specimens of external arrangements exhibited by them, which appear to me to be well entitled to applause. Among these may be ranked the east front of the cathedral of York, a view of which I intended to have had engraved, as an illustrative ornament to the present Number, but have been disappointed. I shall only farther add, that any person who wishes to acquire a competent idea of many of the internal devices above specified, will find no small gratification by consulting the designs of the internal architectural ornaments of the cathedral of York by Mr. Halfpenny, just published: a work that does great credit to the accuracy and perseverance of that ingenious artist.

On the comparative influence of agriculture and manufactures upon the morals and happiness of a people, and the improvement and stability of states.

[Concluded from page 382.]

REVENUE. With regard to this particular, much more may be said in favour of the mercantile and ma-

nufacturing interest, than in respect to any of the departments above named ; and herein the abettors of that cause know that their strength consists : for, whether they produce a greater revenue *in proportion to the exigencies of the state*, or not, they are, doubtless, better adapted for yielding such *in proportion to the wishes of a minister*, than could be drawn from a nation that was purely agricultural.

The only real and legitimate purpose to be served by public revenue is, to enable those who are intrusted with the executive departments of government to afford protection to every individual in the enjoyment of what is his own, in as far as it does not interfere with the welfare of his neighbour. The expence, then, to be incurred in affording this protection will be proportioned to the calls that are made for the interference of the executive power, and the difficulty of enforcing the law in all cases ; but among an agricultural people there is very seldom occasion for this interference in any considerable degree ; and on the few occasions where it is wanted, the law can be easily enforced. A revenue, then, to a very small amount is sufficient to answer all the exigencies of the state ; and, as the population in this case must be very great, the proportion of that revenue which falls to the share of each individual to pay will be very small ; so that the weight of taxes can scarcely be felt among such a people, and they will be, of course, paid with cheerfulness. The revenue, therefore, will always be great in proportion to the exigencies ; and the government will be proportionally rich, though the taxes be very low.

In this way we are easily enabled to account for a

fact that cannot fail to have struck all observers, viz. the immense wealth and splendour that have been always displayed among the rulers of those nations which were justly ranked as agricultural states. The wealth of Ninus and Semiramis; of Solomon, Nebuchadnezzar, and all the Asiatic monarchs in ancient times, may be thus easily explained, because these nations, being all at that time chiefly addicted to agricultural pursuits, and of course extremely populous, could easily pay, without feeling it, some small taxes; which, coming from so many individuals, though they were light to each, yet the amount was high when accumulated into one sum; and from these swarms of people also, the numerous armies which the potentates of those countries brought into the field are easily accounted for. And as wars and expensive regulations but seldom occurred to exhaust the treasury of those princes, it necessarily follows, that after a few years of peace the accumulation of wealth must have become very considerable. And though in the wars of these eastern potentates immense armies were brought into the field at one time, yet these wars occurred but seldom, and were usually of short duration; one victory or two during the course of one campaign, for the most part, decided the contest. The victor, without farther trouble, took quiet possession of the throne that he had gained; and the people, we have good reason to believe, were suffered to pursue their business in peace as before; so that the overthrow of an empire was perhaps less known in its distant provinces than the loss of a battle in Germany is felt by us. The population and productiveness of those countries thus continued to augment for many ages

without interruption, and thus became so great as now to afford matter of astonishment to us.

But since the introduction of war as a trade by the Romans, which was never discontinued; and since the rivalry between neighbouring nations commenced respecting manufactures, and commerce, and colonies; and those everlasting jealousies that spring from the interference of one nation with the internal regulations and external connexions of another, all of them necessarily originating in the spirit of manufactures and external trade, the case has been totally different. Wars have become almost perpetual; and every possible exertion being made by each nation to render itself able to dictate to all its neighbours, the expence of insuring that kind of protection which is deemed necessary has become such, as to render the rulers of every nation comparatively poor, and of course avaricious; so that although the sums drawn from the subjects of each state under the name of revenue be immense, yet they are never found to be adequate to the purpose wanted. Nor does it seem probable, that this can ever be the case so long as this system shall prevail upon the globe; for, instead of resolving, like Pomponius Atticus the Roman senator, to moderate our wishes to our means, and thus enjoy a respectable independence on a moderate income, we are continually grasping at something that cannot be obtained. [From Cornelius Nepos we learn, that Atticus had a very good house; made use of the best things; entertained persons of all ranks, and spent no more than 9l. 13s. 9d. in the month, or 116l. 5s. a year; and this about the time when it was nothing uncommon for a Roman citizen to expend from one to two thousand pounds upon a supper. This

is accounted for by what the historian adds, that he was elegant, not magnificent; splendid, not sumptuous; affected neatness, not superfluity; in short, that he loved the ancient simplicity; lived on plain food, and did not throw away his money on delicacies, which could not be purchased but at extravagant prices. A *mullus* (a small fish which seldom weighs above two pounds) used in those days of luxury to sell sometimes for more than sixty pounds!] If, like an avaricious landlord, instead of retrenching unnecessary expences, we only try to squeeze more from our tenants than they can afford to pay, the consequences are obvious; the estate must be finally abandoned, and go to ruin.

Other particulars originating in this system must not here be passed over in silence. When much money comes thus to be perpetually at the disposal of government, many men must be supported by it. This forms a business artificially created, of great extent, in which multitudes can be supported in greater affluence than they could be in the sober pursuits of agricultural industry. Agriculture is, of course, abandoned as an inferior and subordinate employment. Men become greedy of wealth, and eager in the pursuit of gain, *per fas aut nefas*. Instead of a *Cincinnatus* and a *Fabius*, who cultivated with their own hands the little field that supported their families before they assumed the dictatorial power, as well as after they resigned it, we meet with a *Lucullus* and a *Crassus*, who expend more money at one luxurious meal than would have supported both these respectable dictatorial families for many years [a supper in the *Apollo*, according to the regular establishment of *Lucullus*, was 1614l. 11s. 8d. !!!]

Provisions then fail, as Varro says, not because the fields are grown old, but because we suffer them to perish through inattention. Supplies from abroad become then necessary. The people depend no longer upon their own industrious arm for support, but rely upon obtaining *largesses* from the public. The public revenue thus exhausted (plundered rather) by those individuals who know how to profit by it, private individuals become so wealthy as to be able to intimidate a government, now become feeble through the want of resources, which have almost totally failed since the annihilation of the order of the middling class of people. The people then arrange themselves into two classes, the rich and the poor only. These last are under the necessity of deriving their subsistence now from the *largesses* of individuals, not of the public; and by such means these individuals try to raise themselves into power. Civil wars are the necessary consequence, and finally the overthrow and total annihilation of the state.

Reader, think not that I am here tracing an imaginary picture. It is one that has but too often been woefully realised; but in a particular manner, and most strikingly so in Rome. While the great body of the Roman people made agriculture their chief employment, the expences of government were inconsiderable; the country was well cultivated, and produced abundance for its numerous population, which, in spite of its continued wars, was enabled easily to recruit its armies with Roman citizens; but no sooner was that employment brought into discredit there, than want of provisions was experienced, and supplies of

corn from Sicily and Egypt became necessary. All the other consequences above stated followed in course. And why should not that which has already happened to Rome, and every other state similarly circumstanced (as might easily be proved, did our limits permit), happen likewise at any future period to those states which shall choose to put themselves into similar circumstances? I can see no way of answering the question but in the affirmative.

With regard to *stability*, there is one circumstance which never ought to be overlooked in a question of this nature, viz. the great difference in point of facility with which those who are engaged in trade and manufactures can abandon a country, and withdraw their capitals from it on the slightest cause of disgust, compared to that of an agriculturist. The one is, in many cases, nearly as well acquainted with foreign countries as his own, and has as intimate a correspondence with it; so that he can retire thither with scarcely any trouble or exertion, and almost without feeling the change. The other is fixed in such a way, that it requires an exertion which nothing but extreme necessity can ever induce him to make. The revenue, therefore, which arises from the capital of the one is of a nature that cannot be depended upon; and, should it be withdrawn, an attempt must be made to supply the want by loading agriculture beyond what it can bear. Agriculture, under these circumstances, must at last succumb; and the people, poor and dispirited, must either remain at home a burden to the state, or emigrate to foreign countries. Such is Spain, and such the causes of its decline. Amsterdam was thus established in a few years on the ruins of Antwerp.

I hope, then, that the reader will see just cause to conclude with me, not only from the soundest principles of fair reasoning, but from the actual testimony of historical records continued down from the earliest accounts of time till the present hour, that the prosecution of agriculture as a principal employment in any nation has a more powerful tendency to preserve the morals and augment the happiness of the people, and thus to promote the improvement and insure the stability of states, than any other system of employment that ever yet has been adopted by man : and, in opposition to this, that an undue predilection for manufactures and foreign trade, carried so far as to induce a dereliction of agricultural pursuits in a lesser or a greater degree, has a natural and necessary tendency, first to check the improvement, and then to promote the deterioration of the country ; thus to diminish its productiveness, and to lay the foundation of frequent scarcity and famine : that this must end in depopulation, dependance of the few poor people who shall remain upon alms and largesses from the rich ; and, finally, in the debility and total destruction of the state. Were other illustrations wanted to prove the truth of these positions, the present state of Spain, just at our doors, compared with that exalted rank which she held among the nations three hundred years ago, affords but too striking and undeniable an example for that purpose. And from what rule of judging are we to conceive that Britain is destined to exhibit an example directly the reverse of what has been exhibited by all other nations ? I know of none. The hand of the Almighty is now pressing heavily upon us. Shall we

Minutes on the Construction of Rail-ways. 493

disregard the warning voice? TIME perhaps still is, I hope I shall not live to see the period when TIME, for the benefits that may result from a salutary attention to our situation, shall be NO MORE.

J. A.

Agreeably to the intimation I lately gave, I have been favoured with the following account of the method of making iron rail-ways on the improved plan, by the inventor; which I trust will prove satisfactory to my readers.

Minutes to be observed on the construction of Rail-ways.

First, The best line that the country affords must be traced out, having regard to the direction of the carriage of articles or trade to be expected; and if such trade be both ways in nearly equal quantities, a line as nearly horizontally level as possible should be chosen. If the trade is all in one direction, as is generally the case between mines and navigations, then the most desirable line is one with a gentle gradual descent, such as shall make it not greater labour for the horses employed to draw the loaded waggons down, than the empty ones back; and this will be found to be the case on a rail-way descending about one foot vertical in one hundred feet horizontal. Or, if the rail-way and carriages are of the very best construction, the descent vertical may be to the length horizontal as 1 to 150, where there is little or no upgate loading. In cases between mines and navigations the descents will often

474 Minutes on the Construction of Rail-ways.

be found greater than could be wished. On a rail-way on the improved plan, where the descent is more than as 1 to 50, six or eight waggons, loaded with 30 or 40 hundred weight each, will have such a tendency to run downwards, as would require great labour of one horse to check and regulate, unless that tendency were checked by sledging some of the wheels. On such, and steeper roads, iron slippers are applied, one or more to a gang of waggons, as occasion may require; each slipper being chained to the side of one of the waggons, and, being put under the wheel, forms a sledge. Where the descent is very great, steep inclined planes, with machinery, may be adopted, so as to render the other parts of the rail-way easy. On such inclined planes, the descending loaded waggons being applied to raise the ascending empty, or partly loaded ones, the necessity of sledging the wheels is avoided; and the labour of the horse greatly reduced.

To obtain the desired levels, gentle descents, or steep inclined planes; and to avoid sharp turns and circuitous tracts, it will often be found prudent to cross valleys by bridges and embankments; to cut through ridges of land; and in very rugged countries short tunnels may sometimes be necessary. The line of rail-way being fixed, and the plans and sections by which the same is to be executed settled, the ground for the whole must be formed and effectually drained. The breadth of bed for a single rail-way should be, in general, four yards; and for a double one six yards, exclusive of the fences, side drains, and ramparts.

The bed of road so formed to the proper inclination, and the embankments and works thereof made firm, the surface must be covered with a bed of stones

broken small ; or good gravel, six inches in thickness or depth. On this bed must be laid the sleepers or blocks to fasten the rails upon. These should be of stone in all places where it can be obtained in blocks of sufficient size. They should be not less than 8, nor more than 12 inches in thickness ; and of such breadths (circular, square, or triangular) as shall make them 150lbs. or 200lbs. weight each. Their shape is not material, so as they have a flat bottom to rest upon, and a small portion of their upper surface level, to form a firm bed for the end of the rails. In the centre of each block must be drilled a hole, one inch and a half diameter, and six inches in depth, to receive an octagonal plug of dry oak five inches in length ; for it should not reach the bottom of the hole ; nor should it be larger than so as to be put in easily, and without much driving : for, if too tight fitted, it might, when wet, burst the stone. These plugs are each to receive an iron spike or large nail, with a flat point and long head, adapted to fit the counter-sunk notches in the ends of two rails, and thereby to fasten them down in the proper position.

The rails should be of the stoutest cast iron, one yard in length each, formed with a flanch on the inner edge about two inches and a half high at the ends, and three and a half in the centre ; and shaped in the best manner to give strength to the rails, and keep the wheels in their track. The soles of the rails, for general purposes, should not be less than four inches broad ; and the thickness proportioned to the work they are intended for. On rail-ways for heavy burdens, great use, and long duration, the rails should be very stout, weighing 40lbs. or, in some cases, nearly half

476 *Minutes on the Construction of Rail-ways.*

an hundred weight, each. For rail-ways of less consequence less weight of metal will do; but it will not be prudent to use them of less than 30lbs. weight each, in any situation exposed to breakage above ground*.

In fixing the blocks and rails, great attention is required to make them firm. No earth or soft materials are to be used between the blocks and the bed of small stones or gravel, on which the rails must all be fixed by an iron gauge, to keep the sides at a regular distance, or parallel to each other. The best width of road for general purposes is 4 feet 2 inches between the flanches of the rails; the wheels of the carriages running in tracks about 4 feet 6 inches asunder. Rails of particular forms are necessary where roads branch out from, or intersect each other; and where carriage roads cross the rail-ways; and at turnings of the rail-ways, great care is required to make them perfectly easy. The rails of that side forming the inner part of the curve should be fixed a little lower than the other; and the rails should be set a little under the gauge, so as to bring the sides nearer together than in the straight parts: these deviations in level and width to be in proportion to the sharpness of the curve.

The blocks and rails being fixed and spiked fast, nothing more remains to be done than to fill the horse path, or space between the blocks, with good gravel, or other proper materials; a little of which must also be put on the outsides of the blocks, to keep them in

* In mines, and other works under ground, where very small carriages only can be employed, very light rails are used, forming what are called train roads, on a system introduced by Mr. Carr; and these kinds of light rail-ways have been much used above ground in Shropshire and other counties where coals and other minerals are obtained.

their proper places. This gravel should always be kept below the surface of the rails on which the wheels are to run, to keep the tracks for the wheels free from dirt and obstructions. The form of the rails must be such as will free them from dirt if the gravelling is kept below their level.

In the constructing of the carriages great attention to avoid friction is necessary, particularly in the formation of the wheels and axles, which must be adapted to the sort of rail-ways and the kind of loading; and for which, general directions cannot be given within the limits of this paper.

To the Editor of Recreations in Agriculture, &c.

SIR,

February 9, 1801.

As correcting of error contributes to the improvement of knowledge, I thank an Old Waltonian for his hints respecting the Indian weed in your last Number, page 395, which I before, walking in the old trammels of prejudice through misinformation, always considered as a vegetable production, and with some diffidence (for old prejudices are not easily conquered) reflected thereon; but, having a line of that denomination, I was not long before I made the experiment, and found it truly of animal substance. It appears to me that there are two sorts which come from China, the production of the same insect; the one taken out of the caterpillar before it be spun into a thread; the other combined of several filaments as taken from the web after the caterpillar has spun it. I suspect it to be the production of an insect of the same genus as our silk-worm; the filaments being much coarser,

and of a harsher feel than common silk, consequently of a much larger caterpillar, probably of the phalæna class, which I have reason to think spins a case similar to the caterpillar of the phalæna mori (the European silk-worm moth), from whom the silk gut, so much used by anglers, is taken; but it is an error to suppose that gut ever to be in a fluid state. I opened several caterpillars of the silk-worm with an intention of discovering the quality of the silk whilst it lay in the body of the caterpillar. I found it there exactly similar to the small intestines of animals, coiled up in various folds, and took it out in appearance a single thread, which I extended about a foot in length, and suffered to dry, supposing myself in full possession of silk gut for angling; but to my astonishment when dry it was void of elasticity; brittle, and snapt like a thread of glass of the same size. Whilst under this perplexity I met with a gentleman who had been in Barcelona; he told me, that the method for obtaining the gut was, to lay the caterpillars in vinegar a certain time; but having no caterpillar, either then or since, to make further experiments on, I can speak no further on the subject; except of my experiment on the gut that I had before extracted, which remained in its rigid and brittle state. This I soaked in vinegar for a day or two, when to my surprise it became elastic, tough, and capable of extension some inches: and probably, if it had been properly put in vinegar in the first instance, might have been used with effect by an angler. The best time for extracting the gut is, undoubtedly, the period when the caterpillar ceases eating, and shews signs of its intention to begin spinning its web.

VERA X.

P O S T S C R I P T.

HAVING reached the end of the first stage in the progress of this work, and formed a sort of acquaintance with my readers, which is dear to me, I think it incumbent, as a just return to their kind partiality, on this occasion, to explain, with a greater degree of precision than I dared venture to avow at the commencement, what are the principal objects I have aimed at in this work, and shall ever continue to do, if a continuance of the public favour shall permit it to be carried forward.

The improvement of agriculture, natural history, arts, and miscellaneous literature, then, although they be, in my opinion, objects of high importance among men, and therefore must ever demand from me a principal share of attention, still have ever constituted but a secondary place in my estimation in the business of this work: my primary object was, to give strength and energy to the human mind, by gradually sapping the foundations of prejudice and ignorance. With that view I have uniformly endeavoured to accustom my readers to take notice of such facts as fall under their own cognizance; to reason upon these with freedom, but divested of prejudice, and to draw the necessary conclusions with candour and impartiality. It is this liberal exercise of the human powers that I conceive constitutes the true essence of freedom, and of that energy of mind which can alone elevate man to that supreme dignity of which his nature is susceptible. The first step in this progress doubtless is to destroy that idolatrous veneration for great names, which the system of our education and the rules of *false* politeness, so sedulously impressed on the minds of youth, have such a tendency to establish. It was the risk which I ran of being overpowered by this prejudice that made me so extremely doubtful of the success of the undertaking; for I was fully aware of the objections that might be urged, on this head, to the bold, decisive manner I meant to assume. I was aware, that in an age in which it is the principal study of men both to speak and to write in such a manner as to conciliate the favour, rather than to inform the judgment or enlarge the understanding, of those to whom they address themselves; and where, of course, the arts of cajolment and deception are more studied than the development of truth, an attempt to pursue a course so directly the reverse of all this, must necessarily render the conduct of the person who attempted it liable to a thousand misrepresentations, that would probably be productive of disappointment and chagrin, possibly of obloquy and distress. Of all these things I was fully aware at the time; and, superadded to this, was conscious that pretensions to any uncommon purity of intention were justly liable to strong presumptions of insincerity; yet still the object itself, if it could be attained, seemed to be so very desirable, that feeling myself at a loss for something that could keep the mind alive by awakening its dearest propensities in the evening of life, the attempt, at least, seemed to be worth the making. It has been made, and it is unnecessary for me now to say that the success has far exceeded my most sanguine expectations, convinced even as I was, beyond most other men, of the general rectitude and beneficence of the human heart. I exult in the consciousness that I have not in this respect been mistaken.

The above will serve, with my candid readers, as an apology for the boldness, perhaps some would say *asperity*, that might seem to characterise some of the essays in this work. I am inclined, however, to believe, that, upon a careful revisal of the whole, the reader will find, that, though I have reprehended with freedom on all occasions, asperity, I trust, has been carefully avoided. To guard against this last, scarcely a single individual has been reprehended in these pages (unless in one solitary instance), of whom in general I did not entertain a very respectful consideration; and in no instance have I ever found fault, in which I would not, with a yet greater degree of alacrity, have given the warmest and most unequivocal degree of approbation, had any opportunity occurred in which it could have been done with propriety, consistently with the nature of the subject under discussion at the time.

In the second place, Let it be always considered that my principal object has been to rouse the attention, and to make the mind of the reader feel its own powers, and not to subject it to be servilely influenced by those of any other man. To do this, it was necessary that objects should be placed before him in the strongest

points of view that can be thought of. My object is always rather to provoke discussion than to induce implicit obedience. Few are the objects that any man can know so thoroughly as to speak decisively concerning them; but those are innumerable concerning which he can see that others decide upon without sufficient foundation so to do; and, as the errors which originate in this source are innumerable, it is of importance that they should be pointed out to view.

The public having been so indulgent as to receive with kindness my well-meant exertions hitherto, I am encouraged to continue my efforts in the same train, arrangements having been formed which will prevent the recurrence of those interruptions in the several departments that have been productive of more disquietude to me than can be imagined by those who have not felt it.

It is a source of satisfaction to the Editor that he has presented to the public one book at least which has been conducted from the commencement with the most unceasing attention on his part to enlarge the understanding and improve the heart of his readers, to the attainment of which great objects every other consideration has been made to give way at all times; and if he can flatter himself, that in the prosecution of this plan he has excited on some occasions ideas that would not otherwise have been felt, and aroused the mind into activity from a state of torpor in which it was disposed to indulge, he will be perfectly satisfied with the result of his labour. In future, the same objects will be steadily pursued; and he is just preparing to enter upon a variety of discussions of a nature that he hopes will be still more interesting than those which he has till this time *ventured* to bring forward, for which he had been only paving the way. He will further beg leave to add, that he has made one great experiment, the result of which ought to be known, viz. that *candour and an upright intention in a writer in this country cover a multitude of faults*; for, by the help of these alone, a person who has been all his life precluded in a great measure from the use of books; shut out from the conversation of literary men; who never spent a thought on the graces of diction, and who scarcely ever wrote a line but from the impulse of the moment, has been able so to develop the various objects that attracted his notice, as not to prove disgusting at least to a very numerous and enlightened set of readers. What a striking example does this exhibit of the amazing facilities that candour and integrity confer upon man, when compared with the more difficult attainments of suppleness and deceptious policy! It would be pleasing to him if he could flatter himself with the hope that this example might induce others of superior powers and acquirements to venture upon similar exertions.

The arrangement in future will be more of a miscellaneous form than heretofore, as it is found that it will prove an accommodation to the printer.

It is hoped correspondents will have the goodness to excuse a necessary farther postponement of acknowledgments.

END OF THE FOURTH VOLUME.

A. GOSNELL, Printer, Little Queen Street, Holborn.

I N D E X

TO

THE FOUR FIRST VOLUMES OF RECREATIONS IN AGRICULTURE, &c.

i. ii. iii. iv. denote Vols. I. II. III. IV.—The Arabic Numerals refer to the Pages:

N. B. The letters prefixed to the pages refer to the three divisions in Volume first: A. for Agriculture, N. Natural-history, M. Miscellaneous. Where the figures run on in the same article, without any letter prefixed, they all refer to the division marked at the beginning of that article.

A.

AARHUS, Old, its Gothic spires, iii. p. 123.

Abstinence, surprising instances of, in Arabian horses, i. N. 72.

Abutments, origin and uses of, in Gothic buildings, ii. 428.

Accidents to which a farm is liable, i. A. 87.

Acacia tree characterised, iii. 455.

Acidification of milk, hints concerning it, iii. 344.

Adam, Mr. his memoir on the grub, iii. 425—his proposals for destroying it inefficacious, 427.

African breeds of sheep, ii. 160.

Age much respected among the Indians, iii. 305.

Agnosio's apology for ignorance, ii. 65.

Agriculture, the most necessary of all arts, has made slower advances than others, i. A. 1—causes of this, 2—the language imperfect—exemplified in regard to the word clay, 3—soils how produced, 4—manufacturers more accurate in their distinctions than farmers, 6—all solid substances fitted to sustain some plant, 9—metallic impregnations render soils barren, 9—infertile soils become fertilizers of others, 10—remarkable instance of inexhaustible productiveness of a particular soil, 11—particular manures affect particular soils, instances of, 12—particular soils favourable to particular plants, 14—external appearance of a soil fallacious, a small degree of impregnation produces at times a great change of soil for ever, 15—facts in agriculture can only be ascertained after a great length of time, 18—deceptions in agricultural writings easy to be practised, 19—hence prejudices prevail against agricultural writings in general, 20—evil consequences of this prejudice, 21—a mode of removing this evil suggested, 22—agricultural survey of Britain on a new plan, 23—and of the Netherlands, 25—experience in agriculture an imperfect

VOL. IV.

fect mode of acquiring knowledge, 26—experiments, difficulties attending them, 28—experimental farm, utility of, 29—difficulties that oppose such an establishment, 33—facts that can and cannot be elucidated by an experimental farm, 30—facts, how they may be obtained and concentrated in this journal, 32.

Agriculture, circumstances that tend to accelerate or retard its products, i. A. 85—ditto considered as an object of taste and recreation to a man of fortune, 90.

Agriculture, a synopsis of, v. Synopsis.

Agriculture, circumstances that require to be adverted to in an experimental farm, ii. 1—required to ascertain the nature of the objects that the farmer has to employ, 7—exemplified respecting the varieties of wheat, 10—of oats, 11—varieties of domestic animals, 15—of the dog species, 16—varieties of the sheep kind, 81—woolless sheep, 82—the Argali, 84—Jamaica sheep, 84—Cape sheep, 89—Stateopyga, 89—Finland sheep carrying long hair, 90—distinctions between hair and wool, 93—Cornish sheep, 161—the Lammermoor sheep, 163—Spanish sheep, 164—varieties of English breed, 164—Carmanian sheep, 165—diversities in point of size, 169—in respect to the tendency to fatten, 241—to taste of the meat, 242—to generate tallow, 245—prolificacy, 246—golden fleece, 256—varieties of the goat kind,—respecting the fleece, 322—wool of goats very fine, 323—the Angora goat,—in respect to milk, 327—the Strella goat, 327—miscellaneous remarks on wool, and the various breeds of sheep, 401.

Agriculture, varieties of the nos tribe, iii. 1—respecting wool, 3—the Zebu, 6—Holdernefs cattle, 8—Bison of Louisiana, 8—Chittigong cow and Sarluc, 10—the Yak of Tartary, 11—the musk ox of Hudson's Bay, 14—figure of ditto, 17—2nd. varieties respecting size, 81—the Urus, the Arnes the largest, 82—

2 I

- the *Tom* breed from Africa the smallest, 86—Indian cattle, 88—the Guernsey and Highland cattle, 88—3d. varieties respecting *milk*, 94—Highland breed and Holderness, 96—portrait of the Arnee, 99.
- Agriculture, dairy, iv. 1—81—on the construction of waggon, 94—on the varieties of cattle, 162—on British clothing wool, 171—on the varieties of horses, 242—on the rearing of potatoes, 247—on the varieties of the Ass tribe, 321—mules, 328—on rearing early potatoes, 334—notice of Tarello's treatise on agriculture, 401—on rearing potatoes, 425.
- Agriculture, a complete body of, the inexpediency of an attempt of that sort, iii. 78.
- Agriculture, lectures on, by Dr. Cullen, notices of, ii. 222.
- Agriculture, manufactures, and trade, their influence on the prosperity of a kingdom compared, vide a Comparative view.
- Agriculture, Tarello's treatise on, iv. 401.
- A digression on the management of the dairy, iv. 161—vide Dairy.
- Agricultural survey of Britain proposed on a new plan, i. A. 23—and of the Netherlands, 25.
- Agriculturist, man eminently distinguished as such, i. N. 18.
- Agriculturists have made inaccurate discriminations of clay, i. A. 5.
- Air, in what way it may be employed at pleasure, either for transmitting heat quickly, or for excluding it, i. M. 212—in what way a stratum of air may be made to exclude heat more effectually than any solid body, 217.
- Alces, an animal mentioned by Caesar, Qu. ii. 74.
- L'Allegro of Milton criticised, i. M. 197.
- Alderney cow affords the richest milk, iii. 94.
- Amicus, query by, respecting a poker, iii. 151—remarks on, 152.
- Amputating fruit trees, time for, i. M. 117.
- Anderson, Dr. of Madras, his communication of the mode of making chunam in India, i. M. 1.
- Anderson, Dr. of Madras, correspondence with, iii. 224—on the cure of the bite of a snake, 225—on the cultivation of hemp in India, 229.
- Anecdote of Mr. M^cLaurin, iii. 152—and Charles the Second, 154.
- Anemone, sea, an animal so called, ii. 80.
- Anemone, the sea, how propagated, ii. 185.
- Anglicisms and Scotticisms, observations on, ii. 434.
- Angiolina del Duca, see a Robber.
- Anglicisms, see Scotticisms.
- Anglo-Asiaticus, his account of chunam, i. M. 64.
- Angora goat, account of, ii. 322.
- Animalcula infusoria, their mode of propagation, ii. 104—are all females, 104—adhere each to the same law in this respect, 105.
- Animalcula infusoria preserved in life by desiccation, ii. 254.
- Animals which have been long apparently dead in a dry state that may be revived, many instances of, ii. 253.
- Animal flower, account of, ii. 80.
- Animals are viviparous and oviparous, ii. 21—and ramiporous, 111.
- Animal that propagates by dividing into four parts, ii. 106—one that throws off small fragments that become living young, 107.
- Animals, general disquisitions concerning them, i. A. 53.
- Animals, mere, are not susceptible of harmonic sensations, i. N. 21.
- Animal and vegetable remains tend to render the soil fertile, i. N. 34.
- Animal bones, resemblance of, in limestone only a deception, i. M. 128.
- Ancients, their knowledge of natural-history lost to us, owing to their want of classification, i. N. 1.
- Ants, a surprising instance of their power, i. N. 14.
- Antwerp ruined by the loss of its manufactures, iv. 292.
- Aphides can be propagated without any males, and are viviparous, ii. 95—at a particular time are oviparous, and have then males, 96.
- Aphorisms respecting the circumstances that affect the separation of cream from milk, iii. 1st. 322—2d. 325—3d. 326—4th. 327—Important corollaries deducible from them, 327 to 347.
- Apples, how preserved from frost in America, i. M. 24.
- Apple tree, the coccus of, described, iv. 33—how to eradicate, 34.
- Apples, on the varieties of, iv. 74.
- Apology, an, for ignorance, ii. 65.
- Arabian horses, how brought to bear abstinence and fatigue to an extraordinary degree, i. N. 71.
- Arable farm, on the general management of one, i. A. 67.
- Arch, the principles of, ii. 423—pointed arch, origin of it in Gothic buildings, 424.
- Archimedes, his proposition rectified, iv. 96.
- Architecture, thoughts on the origin, excellencies, and defects of the Grecian and Gothic styles of, ii. 187—280—418.

I N D E X.

Architecture, Grecian and Gothic, thoughts on their excellencies and defects, iii. 115.
Architecture, Grecian and Gothic compar- ed, iv. 272—382—448, vide Grecian.
Architrave, the Grecian, origin of, ii. 188.
Arenaria verna, grows only on lead rub-
 bish, i. A. 9.
Argali, or wild sheep of Pallas, ii. 84.
Argonautic expedition, probable causes
 of, ii. 251.
Arithmetic, the octal system preferred to
 the decimal, iv. 438.
Arnee, the largest animal of the bos
 tribe, iii. 82—figure of, 99.
Arra on destroying the gooseberry cater-
 pillar, i. M. 258.
Arra, his observations on heat, ii. 115—
 remarks on, 124.
Art of reasoning, on, iv. 217.
Asclepias, iii. 314.
Assembly room of York by Burlington,
 ii. 282.
Asiaticus, his queries respecting water,
 iv. 152.
Afs, a tame one, interesting account of,
 i. M. 57.
Afs tribe, on the varieties of, iv. 322—
 Zebra, 325—the wild afs of scripture,
 326—Spanish afs, 327—the Sardinian
 afs, 328.
Atmosphere, the, its important influence
 in nature, i. N. 40.
Atticus, his elegant economy, iv. 468.
Authorities for history, cautions respect-
 ing them, ii. 449.

B.

Babylonian willow, a valuable sort, i. N.
 96.
Bakewell, Mr. his system of improving
 cattle investigated, i. N. 75.
Bakewell, reasons why he did not push
 his experiments farther, ii. 249.
Balance, a simple one described for cur-
 ing butter, iv. 92.
Banqueting hall characterised, iv. 285.
Barbadoes nearly depopulated by the ra-
 vages of ants, i. N. 14.
Bark of trees, the chief seat of their dis-
 eases, i. M. 71.
Bark of trees filamentiferous, iii. 315.
Barometer, its diurnal variations, iii. 287.
Barren soils, what, i. A. 9.
Bay-leaved willow, the wood of it may
 be made into paper, iii. 316.
Beans, how to preserve them from being
 hurt by the black puceron, i. M. 188.
Bear, singular mode of hunting him, i.
 N. 10.
Beech nut, uses that may be made of it—
 affords a valuable oil, ii. 384—mode of
 extracting it, 386—and a valuable food
 for man and beast, 388.

Bee, singularity of, respecting the sex, ii.
 33—Queen, or female bee, lays 50,000
 eggs, 34—male bee, 34—neuter, 35—
 foreknow the sex of their offspring,
 37—can transform a neuter into a fe-
 male, 38.
Bees, hints for the preservation of, ii. 271.
Beluga, on the causes of its migrations,
 i. M. 124.
Belus, the temple of, iii. 119.
Benevolus on an economical way of mak-
 ing bread, iv. 314.
Ben Lomond, a poem, quotation from,
 iii. 219.
Best breeds of animals, rules for selecting
 them, i. N. 81.
Bigotry, its baneful influence, ii. 202.
Billingsgate market described, iii. 43.
Birch, Clement, his proposal for bettering
 the condition of the rich, iv. 54—304.
Bison of America affords wool, iii. 8.
Bite of a snake cured by spirit of harts-
 horn, iii. 225—and eau de luce, 227.
Blackbird, white, how produced and per-
 petuated, i. N. 63.
Blindness, advantages of, ironical, iii. 469.
Blinking, a question ludicrously de-
 scribed, iii. 471.
Blight, a disease so called, occasioned by
 the coccus, iv. 26—means of eradicating
 this insect, 29—the apple coccus, 33.
Blood may be generated at pleasure, iii.
 250—a remarkable instance of, 251.
Blossoms of gooseberries and cherries
 plucked off by sparrows, ii. 137.
Bogs may be occasioned by grubs, iii. 444.
Bombyx Lanestrie, its chrysalides pre-
 served for three years, ii. 269.
Boots made of coutchouc, iii. 71.
Bos tribe, see Cattle.
Boucharian sheep, their fleece fine hair,
 ii. 89.
Bread, an economical mode of making
 it, iv. 314.
Breeds of animals, how distinguished from
 varieties, i. N. 85.
Breeds, the varieties of animals so called,
 how they may be lost, or perpetuated,
 i. N. 65.
Breeding cattle, benefits that dairy farm-
 ers would derive from breeding their
 own, iii. 170.
Britain, the dangerous system of policy
 she is now proceeding in, iv. 472.
Britain, an agricultural survey of it pro-
 posed on a new plan, i. A. 23.
British wool, society for the improve-
 ment of, instituted, iv. 173.
Buffalo, vide Bison.
Buff leather, what, iv. 165.
Bug, a, lives three months without food,
 iv. 272.
Buildings necessary on a farm, i. A. 7.
Bulbed polypus, how propagated, ii. 80.

Bushy-tailed bull, see **Yak**.
Butter of a very fine quality, how it may be made, iii. 329—336.
Butter of the finest quality can be only made in a cheese dairy, iii. 336.
Butter of a fine quality cannot be made while the milk is perfectly sweet, iv. 6.
Butter, process for making, iv. 10—salted butter, best mode of preserving it—an improved mode of curing butter, 84—refined butter, how to prepare, 86—medicated butter 87—how butter may be kept sweet while using it, 93.
Butter, a cow whose milk never yielded any, ii. 247.
Butter, vessels proper for preserving it salted, iv. 82—how to separate from the milk, 83—an improved mode of curing it, 84—may be carried to India safely, 85—how it may be refined, 86—and medicated, 87.
Butterfly lives four days after losing its head, iv. 269.
Byggé, Professor, on the metrical system of France, iv. 428.
Byssus revived after being dried, ii. 263.

C.

Cabbages, mongrel varieties of, i. N. 88.
Cactus mitis, a wholesome food for man and beast, ii. 215.
Cæsar, animals mentioned by him, ii. 72.
Cadjeput oil reduces coutchouc into a fluid state without destroying its elasticity, iii. 383—queries respecting it, 386.
Calcareous matter, the opinion that it is of animal origin contested, iii. 368.
Calculations amazingly facilitated by the octal system of arrangement, iv. 447.
Calendar, the French, imperfections of, iv. 436.
Calves, a singular practice respecting the rearing of them, iii. 330.
Cam, an ode to, ii. 77.
Camillo Tarello, notices of his book on agriculture, iv. 431—true principles of, 417.
Campania of Rome, miserable reverse of its state, iv. 380.
Cape sheep, ii. 89.
Cape sheep, a particular variety of, iv. 334.
Capra gigantea, ii. 329.
Caprification of figs noticed, ii. 392.
Carmanian wool, ii. 247—397.
Carts, light ones preferred to waggons, iv. 97.
Cast iron rail-ways, see **Rail-ways**.
Castigator, his letter to the Editor, concerning Mr. Pope, i. M. 193—answer to it, 195.
Cat, a singular instance of one producing kittens without a tail, i. N. 69.

Catch set to music, *White sand and gray sand*, as a model to the watchmen for regulating their cry, i. M. 246.
Caterpillars and grubs, in what respects useful, i. N. 14—are of no sex, 14.
Caterpillar, the gooseberry, easy and efficacious mode of destroying it, i. M. 185.
Caterpillars, some not killed easily by cold, ii. 269.
Cathedral, architecture of, iv. 274.
Cattle, on the varieties of, iii. 1—respecting hair, fur, or wool, 3—respecting size, 81—respecting milk, 94—Holderness breed of, 8.
Cattle, respecting bodily strength and ability to bear fatigue, iv. 161—respecting their skins, 164—respecting their tendency to fatten, flavour of flesh, &c. 166.
Cautions respecting the mode of laying out iron rail-ways, iv. 210.
Cedar of Lebanon, its picturesque powers exemplified, iii. 455.
Cellars that shall be always cool, how to be economically formed in warm climates, i. M. 221.
Central towers of cathedrals, origin of, iii. 118.
Charlæleon fly, on its transformations and habits, iv. 186—its figure, 195—further observations, 196.
Characters, two singular ones, iv. 239.
Charles the Second, anecdote of, iii. 154.
Charles III. king of Naples, anecdote of, iii. 316.
Chastity, the power of, inimitably portrayed by Milton, i. M. 201.
Chemical philosophers, their aberrations in the art of reasoning noticed, iii. 360.
Cheese, richness of, the meaning of that phrase, iii. 381.
Chesnuds improved by engrafting, ii. 392.
Cheviot breed of sheep, ii. 164.
Chicken, how soon it attains its knowledge, i. N. 7.
Chinese fishes described, iii. 457.
Chinese government, its stability owing to its being an agricultural state, iv. 296.
Chittigong cow, its soft hair, iii. 10.
Chrysalides, their existence may be shortened or prolonged at pleasure, ii. 269—a singular fact respecting them, 269.
Chunam, or fine marble-like cement, of India, mode of making it, i. M. 1.
Church, architecture of, iv. 274.
Churn, the properest kinds, iv. 9.
Churning, niceties to be observed in this process, iv. 10.
Cincinnatus, Fabius, Crassus, and Lucullus compared, iv. 469.
Clarke, Dr. of Edinburgh, singular anecdote of, iii. 250.

I N D E X.

- Classification, the, of natural objects, a necessary step in that study, i. N. 1.**
- Clays inaccurately discriminated, i. A. 3.**
- Clement, vide Birch.**
- Climate, variations of, how produced, i. N. 42.**
- Climate has little effect in altering the nature of animals, ii. 172.**
- Clothes, how to preserve from the destruction of the moth, iii. 183.**
- Cloth preserved by coutchouc, iii. 73.**
- Clout, Colin, his observations on sparrows, iv. 80.**
- Clumsy waggons, inconvenience of, iv. 103.**
- Cluster polypus, how propagated, ii. 177.**
- Coal, pit, does not grow again in places from whence it has been taken, i. M. 249.**
- Coal, pit, the opinion that it is of vegetable origin contested, iii. 371.**
- Cobwebs, when covered with dew, produce the staggers in horses, i. M. 230.**
- Coccus insects, on the transformation of, iv. 17.**
- Coccus tribe of insects, or gall insects, observations on, iv. 17—peach-tree coccus, 19.**
- Cochineal insect, abortive attempts to introduce it into India, ii. 224.**
- Cock-chaffer fly, on the transformations and peculiarities of, iii. 402—its larva a voracious grub, 421—different appearances of, supposed to indicate changes of weather, 423—in its fly state a scarabæus, 423—is destructive in both states to the produce of the fields, 424—various ineffectual attempts to destroy it, 426—surprising numbers of grubs consumed by a family of jays, 428—fly, how it may be killed, 430—surprising number killed by a few boys, 431—destroyed by another scarabæus, 432—additional hints tending to prevent the ravages of this insect, 438—by employing scarabivorous insects, 439—and rooks, 440—and laying baits for them by man, 441—by flooding with water, 442.**
- Coincidences of ideas and expressions often occur where there is no sort of plagiarism, striking instances of, 210.**
- Coins octally divided, iv. 446.**
- Cold climates, evergreens not peculiar to, iv. 53.**
- Cold, caterpillars and chrysalides that bear a great degree of it without being killed, ii. 267.**
- Cold in the superior regions accounted for, ii. 120.**
- Colissæum, bad taste of its external ornament, ii. 200.**
- Colonnade, the origin and singular utility of, in Greece, ii. 189.**
- Colonnade, architecture of, iv. 274—its excellency and defects, 283.**
- Coloured poultry, horses, and cattle, how to be accounted for, i. N. 65.**
- Columbus, notices of him and his family by Col. Tatham, iv. 61—figure of one of his galleons, 63—inscription on the tombstone of his son, 64.**
- Column, the Grecian, origin of, ii. 187—at first made of wood, 187—afterward of stone, 191—changes that this produced in their position and proportion, 192—defects of, 196.**
- Columnar crystals of water, how produced, i. M. 11,**
- a Comparative view of the influence of agriculture and manufactures on the prosperity of states, iv. 36—manufactures promise fallaciously, 39—tend to corrupt the minds of youth, 40—encourage drunkenness and dissipation, 42—Further observations on, 127—Fallacious reasoning on the subject pointed out, 128—fluctuations in the earnings of manufacturers; effects of, 132—apparent flourishing of agriculture no sure test of real prosperity, 136—farther continued, 290—Spain and Antwerp, causes of their decline, 292—the stability of the Chinese government owing to its being agricultural, 296—farther continued, 368—the effects of agriculture and manufactures compared with respect to population, 368—internal tranquillity, 380—revenue, 465—and stability, 471—in all which respects the agricultural state is found to excel that of a mercantile and manufacturing state.**
- Comparison between the average load of a horse in a cart and in a waggon, iv. 97.**
- Comus, the, of Milton, a slight critique on, i. M. 199.**
- Consumption of the lungs might be prevented by the use of flues, i. M. 249.**
- Conversation, a curious one, iii. 46.**
- Cool air may be collected in wells, and preserved for use, i. N. 218.**
- Cordage, a perfect sort, and indestructible by moisture, made of coutchouc, iii. 77.**
- Corn in a wet harvest, hints respecting the mode of drying it by a kiln, ii. 158.**
- Cornice, the Grecian, prototype of, ii. 188.**
- Cornish hair, wool so called, ii. 161.**
- Correspondence with Dr. Anderson, Madras, ii. 217—303.**
- Correspondence concerning Dr. Cullen's lectures on agriculture, ii. 232.**
- Correspondents, to, i. M. 43—94—141—239—279.**
- Correspondents, to, ii. 158—480.**
- Correspondents, to, iii. 237.**
- Correspondents, acknowledgments to, iii. 488.**

I N D E X.

Constarphin cream, preparation of, iii. 346.

Cosmetic, a beautiful one may be obtained from the excrements of an insect, iii. 186.

Cotton syphon, useful in irrigation, i. M. 251—illustrated by figures, 252.

Cotton, a fine sort from the Mauritius introduced into our settlements, ii. 216.

Coutchouc of Pulo-pinang, some account of; iii. 66—the manner of concreting the juice, 68—and making gloves, boots, &c. of it, 71—covering cloth with it, 71—uses that may be made of it for preserving cloth from rotting; and making it impervious to water, 73—roofs to houses, nets, 75—fishing-lines, 77—cordage, 77.

Coutchouc, farther observations on, 202—may be employed to preserve paintings from the action of the air, 202—manner in which paintings might be as it were hermetically sealed within two coats of, 205.

Coutchouc, farther observations on, 376—botanical description of the *urceola elastica*, 377—hints tending to get this plant farther propagated, 379—the concrete coutchouc, experiments on, 381—can be reduced to a fluid state without losing its elasticity, 383—a list of other plants that afford similar juices, 385.

Coventry, Dr. a singular oat belonging to him, i. N. 69.

Cow, a very singular kind of, 247.

Cow, a remarkable one, 95—another, ditto, iii. 165.

Cows, general management of, for the dairy, iii. 241—should never be allowed to be lean, 242—should be provided with succulent food in winter, 243—should be petted in summer, 244—stall feeding useful, 245—should be kept in a moderate and equable temperature, 246—should be kept remarkably clean, 247—and should be milked three times a day, or oftener, 248—how the quantity of milk may be augmented, 249.

Covent Garden church characterised, iii. 289.

Covent Garden market described, iii. 45.

Cream never separates from milk till an acid be produced, iii. 337.

Cream, way of preserving it till it be churned, iv. 6.

Cream, how long it may be safely kept before it be churned, iv. 76.

Creaming-dishes, proper form of, iv. 4.

Cretté de Palluel, see Palluel.

Criméan sheep, ii. 100.

Criticism, what it should be, i. M. 196.

Crocus, the, address to, i. M. 277.

Croques plucked up by sparrows, ii. 138.

Crystallizations, farther observations on, i. M. 126.

Crystals, on the different kinds of, i. M. 13—saline ditto, 13—Crystals produced by the cooling of bodies, 14—varieties of form that the same crystals assume, 15—exemplified with respect to the various forms of ice.

Cui Bono, by Dean Tucker, iii. 210.

Cullen, Dr. correspondence respecting his lectures on agriculture, ii. 232.

Culture, on the, of vegetables in general, i. A. 55—ditto of particular crops, 57.

Culture of the soil necessarily produces plenty, iv. 294.

Cumberland breed of sheep, ii. 164.

D.

Dairy, practical remarks on the management of, iii. 162—1st. choice of cattle for, 163—2d. kinds of food, and mode of feeding cows for the dairy, 174—3d. general management of dairy cows, 241—4th. times of milking the cows, 248—5th. general aphorisms respecting the separation of cream from milk, 321—6th. on the dairy, or milk-house, particular directions for constructing it, 402.

Dairy, on the management of, iv. 1—on the utensils of, 1—metallie dishes, danger of, 2—Creaming dishes, 4—cautions on separating the cream, 5—how the cream ought to be kept, 6—milk must be churned before the butter can be made, 7—cream may be kept for months, 8.

Dairy, the churn, its best form, iv. 9—niceties in the process of churning, 10—water should not be used in making butter, 11—necessity of keeping the vessels sweet, 81—directions for doing this, 31, note A—salted butter, the best mode of preserving it, 85—process of preparing it for being salted, 83—an improved mode of curing butter, 84—refined butter, how to prepare, 86—medicated butter, 87—a simple balance for ascertaining the proportion of salt, butter how to be kept sweet while using it, 23.

D'Alembert, M. memoirs of, iii. 49.

Date of books, observations on, ii. 308.

Debraw, Mr. his experiments on bees, ii. 39.

Deafness, wilful, utility of, iii. 473.

Deceptions in agriculture easy, i. A. 19.

Decimal and centesimal divisions, imperfections of, iv. 434—octal division preferable, 473.

Deer, the red, account of one, i. M. 59.

Deer horns, particulars respecting them, i. M. 261.

Deer, curious observations on, ii. 367.

I. N D E X.

Definition of taste attempted, iv. 143.
 Desiccation of their bodies, various animals preserved in life by, ii. 253.
 Descriptive poetry, remarks on, iii. 388.
 Devonshire cattle, iii. 98.
 Devonshire colic, cause of, iv. 3.
 Diagram illustrative of Gothic and Grecian style of architecture, iv. 393.
 Dialogue, poetical, a fragment, iv. 237.
 Discords, not in a technical sense defined, iv. 147.
 Diseases to which particular crops are liable, i. A. 18—ditto of domestic animals, 88.
 Dog species, varieties of, ii. 10.
 Dogs that carry wool, varieties of, ii. 168.
 Domestic economy, sly observations on, ii. 205.
 Double flowers, observations on, i. N. 91.
 Dray horse, English, iv. 242.
 Drying corn, hints concerning it, ii. 158.
 Dunkers, a small breed of sheep, ii. 104.
 Dutch breed of cattle, iii. 8.
 Dutch mode of curing butter, iv. 184.
 Dwarf, a remarkable one, account of, i. M. 61.
 Dyer, George, an ode to the river Cam by, ii. 77.
 Dyer, George, ode to Dr. R. Anderson, iv. 79.

E.

Ear for music, some men have it not, i. N. 20.
 Earths, which of themselves are naturally infertile, sometimes render others more productive, i. A. 10.
 Earth-worm, each individual is of two sexes, ii. 95—may be propagated by cuttings, 97.
 Earwig, on its transformations and habits, iii. 349—its larva nearly the same figure with the imago, 351—feeds on fruit, 351—in its imago state it has wings of a singularly curious construction, 351—described and figured, 352—the eggs hatched by the parent, 354—remarkable size when newly hatched, 355—devour one another when pinched for food, 356—how to destroy them, 357—varieties of, 357.
 Economical considerations concerning live stock, i. A. 67.
 Economy in regard to implements of agriculture recommended, i. A. 47.
 Economy recommended, ii. 41.
 Economy of nature in respect to the generation of blood and milk, iii. 259.
 Eggs of larger animals produce young resembling their parents, ii. 24—of birds and insects discriminated, 26—that grow, 29—eggs that contain several young, 30.

Eggs sometimes bear much cold, ii. 268.
 Egret, Lord Nelson's, described and delineated, i. M. 96.
 Egyptian halls, account of, ii. 281.
 Elementary parts of nature, their importance in this universe, i. N. 32.
 Elephant, his reasoning faculty greatly inferior to man, i. N. 6.
 Elephant may be made to breed in a tame state, ii. 18.
 Elm bark, its uses, iii. 315.
 Eminent authors the most proper objects of criticism, i. M. 196.
 Engrafting, beneficial effects of it, and means of extending its influence suggested, ii. 390.
 Engrossing, strictures on the iniquity of that practice, and hints for repressing it, ii. 478.
 Entomology, uses that may be derived from the study of, iii. 252—farther observations on, 436.
 Entomophilus, his observations on entomology, iii. 257—on the earwig, 348.
 Eolian harp described, i. M. 97.
 Ephemera fly, on its transformations and peculiarities, iii. 18—description of, in its larva and imago state, 21—figure of, 24—singular phenomenon exhibited by it on the river Seine, 26—short life of, and mode of propagation, 32—varieties of, 35.
 Eutyches, his sly observations on happiness, iii. 139.
 Evaporation of water, process of, i. N. 38.
 Evergreens, thoughts on the physical causes of, iv. 46—cautions respecting them, 48.
 Excrements of an insect afford a fine pigment and cosmetic, iii. 135.
 Excrementitious fluids of animals are occasionally converted into blood or milk, iii. 259.
 Expansion of ice, its amazing power, i. N. 37.
 Expence of waggons enormous, iv. 104.
 Experienced distinguished from experiment in agriculture, i. A. 26—detects of each, 20—28.
 Experimental farms, imperfections of, i. 29—plan proposed by the author to obviate these difficulties, 32.
 Experimental farm, hints concerning it, ii. 1—objects that best admit of being elucidated by an experimental farm, 5—varieties of wheat, 10—ditto of oats, 11—varieties of dogs, 16—ditto of sheep, 81—161—242—kinds carrying hair, and others wool, 165—different sizes of, 169—on the influence of climate, 172—ditto of goats, 321—wool of, singularly fine, 322—Angora goat, 322—Thibet goat, 326—Portuguese ditto, 327—large Hindostan ditto, 329—varieties of cat-

tle, iii. 1—*with regard to wool*, 2—the
Bison, 8—the Yak, 11—the musk ox,
18—*with regard to size*, 81—the arnee,
82—the Tom breed, 86—Indian cattle,
88—Guernsey ditto, 88—*with respect
to milk*, 94—the Kilroe breed, 94—the
Holderness ditto, 97—the Suffolk and
other English breeds, 98—*respecting
bodily strength*, iv. 161—*respecting their
skins*, 164—buff leather, 168—*respect-
ing their tendency to fatten*, 166—on
the varieties of the horse kind, 241—
Suffolk punch, 242—Lanerk horse, 243
—Iceland horses, 244—Galloway, 245
—Shetland, 246—on the varieties of
the ass, 321—the mule, 328.
Experimental agriculture, hints that re-
quire to be chiefly adverted to in, iii. 1
—81.
**Experiments on the best mode of rearing
potatoes**, iv. 249.
Exportation of wool should be permitted,
iv. 181.
External appearance of a soil fallacious,
i. A. 15.
the Eye, in how far it may assist in
choosing a good breed of animals, i.
N. 82.

F.

Fabricius, his entomology, iii. 35.
Facts in agriculture cannot be ascertained
but in a long course of time, i. A. 18.
Family likenesses, how accounted for, i.
N. 70.
Farm, experimental, hints respecting the
circumstances that require to be ad-
verted to by such an institution, iii. 1
—81—iv. 161—241—321.
Farm waggons, absurdity of using them,
iv. 109—a striking illustration of, 111.
a Farmer may be a gainer, though the
produce of his farm be diminished, iv.
129.
Farmer's Boy, a poem, characterised, iii.
391—quotation from, 392—farther re-
marks on, 393—and quotation, 396.
Farquharson, Mr. his remarkable breed
of milch cows, iii. 96.
Fashions, changeableness of, ii. 42.
Fatten, the propensity to, depends upon
the breed of animals, ii. 242.
Female profligacy, observations on, i. M.
205.
Fences, different kinds of, i. A. 48.
Fertile soil, a remarkable instance of con-
tinuing long unexhausted, i. A. 11.
Fibres of wood that may be converted
into paper, iii. 315.
Figs, important notices of, ii. 392.
Figure of the musk cow and bull, iii. 17—
the Ephemera in its worm, pupa, and
imago state, 25—the Arnee, 99—the
Formica-leo in its worm, pupa, and

imago state, 103—the wing of an ear-
wig, 352—milk-house plan, &c. 417
—the Cock-chaffer fly in its larva and
imago state, 420.
Figures, the Kermes insect and Ilex, iv.
36.
Filamentiferous plants, remarks on, iii.
312—hemp & flax, nettles, 312—giant
hemp, 313—sea grass, 314—bark of
trees, Otaheitean cloth, 315—fibres of
wood, ditto, 315—palm tree, bay wil-
low, 319.
Filamentiferous plants in India, short
list of, iii. 232.
Filtering machine, a powerful one, i. M.
285.
Finland sheep carry hair, ii. 90.
Fishes, on the migration of, i. M. 124.
Fishing-nets and lines rendered inde-
structible by coutchouc, iii. 77.
Fishes, in what manner their spawn is
fecundated, ii. 50.
Fishes in India, singular phenomena re-
specting them, ii. 259.
Flavour of meat, disquisitions on, ii. 243.
Flax, on the cultivation of, in India, iii.
229.
Fleece, the golden, an animal producing
it probably exists, ii. 251.
Flies and bees preserved in life by immer-
sion in water, ii. 270.
Flies, viviparous, account of, iv. 260.
Flower garden described, iii. 446.
**Fluctuations in the earnings of manu-
facturers**, pernicious effects of, iv. 132.
Flues, a mode of constructing them so as
to prevent the waste of any heat, ii.
151.
Flues, or stoves, great benefits that would
be derived from the use of them in
Britain, i. M. 249.
Fogs, how produced, i. N. 39.
Food has little effect in varying the size
of animals, ii. 170.
Food, kinds of, that are best for milch
cows, iii. 174.
Forest life, description of, iv. 236.
Forficula auricularia, see Earwig.
Formica-leo, or lady fly, account of, iii.
100—remains two years in its larva
state, 100—its form and singularity of
manners, 101—figure of, in its different
states, 103—its patience and persever-
ance, 104—its surprising strength, 105
—and power of abstinence, 109—its
pupa state, 111—in its fly state, 113
—varieties of, 114.
Forsyth, Mr. some account of his disco-
veries respecting trees, i. M. 60—ditto
continued, 116.
Forsyth, Mr. his book on fruit-trees
enounced, iv. 159.
Fortune, directions how to make one,
iii. 172.

I N D E X.

Foulis, sir James, his poetical address to the Linden Tree, iii. 301.
 Fowls without a tail, i. N. 68.
 Free-masons, origin of the society of, ii. 286—their singular improvements traced, 290—418.
 Freezing of water does not depend entirely on the intensity of the cold, i. M. 23.
 Freezing, the surprising extension of water in the act of, i. N. 37.
 French metrical system, imperfections of, iv. 428.
 Frogs, how propagated, ii. 30.
 Frost in vallies sooner than on hills accounted for, ii. 129.
 Frost, some of the principal phenomena of, i. M. 16.
 Frost excluded by means of straw, i. M. 23—and by means of a linen cloth, 24—by means also of a loose rope, 25.
 Fuel, considerations respecting it, i. A. 80.
 Fuel may be dispensed with in many cases in hot-houses, iii. 482.
 Furze, see *Ulex Europæus*.

G.

Gabriel Watson, the great loads his horses carry, iv. 101.
 Gall ants, origin of, ii. 29.
 Gall insects, see *Coccus*.
 Galloway, a small-sized valuable Scotch horse, iv. 245.
 Garden, a magnificent one, i. M. 51.
 Garden, experimental, established at the Cape by lord Macartney, ii. 217—plan of its arrangement, 219.
 Garden, a singular one, iii. 446.
 General lover, by C. Lambe, iv. 237.
 Generative faculty—the growth of the horns of the deer inseparably connected with it, a curious instance of, i. M. 264.
 Geese, wild, effectually excluded from corn fields by means of a rope only, i. N. 14.
 Geography, how it may be made a pleasing and interesting recreation, i. N. 43.
 Giant hemp, iii. 312.
 Gilpin, John, the ballad of, characterised, i. M. 275.
 Gimarro, see *Joumarre*.
 Gloves made of coutchouc, iii. 71.
 Goats, varieties of, ii. 324.
 Gold and silver fishes described, iii. 457.
 Golden fleece, some account of, ii. 251.
 Goose, a remarkable variety of, ii. 242.
 Gooseberry caterpillar, efficacious mode of extirpating it, i. M. 185—confirmed, 258.
 Gooseberry caterpillars, remarks on, ii. 135—274.
 Vol. IV.

Gooseberry caterpillar, farther remarks on, iii. 234.
 Gooseberry bush, an undescribed disease of, noticed, iii. 268.
 Gothic architecture, on, ii. 280—418.
 Gothic architecture illustrated, iii. 112—devices adopted for forming the nef, 116—central towers, origin of, 118—the temple of Belus, pyramids, and obelisk, 119—spiral towers or spires, 121—of Strasburgh, 122—of Old Aberdeen, with a view, 123—of St. Giles's church, Edinburgh, 124—double towers, 129—Gothic windows, 129—the east window of York cathedral, 131.
 on Grandeur and sublimity in artificial structures, iii. 191—rules for judging of, 192—hay-stack an object of great sublimity, 194—description of, 196—magnitude and simplicity of form constitute the idea of grandeur here, 197—St. Paul's church, London, loses its effect from the complication of its parts, 199—the Pantheon of Rome, 199—wall at the King's Bench prison, 199—ruins, circumstances that constitute grandeur in them, 200—and the picturesque, 201—St. Paul's church, Covent Garden, 289—incongruity of, 290—the palace of Hampton Court, its defects, 291—of Whitehall, 292—the unexecuted model of St. Paul's church peculiarised, 292—sir John Vanbrugh, why he failed in his attempts at grandeur, 293—his structures characterised as picturesque, 293.
 Gothic cathedrals compared with Grecian, iv. 393—vide *Grecian*.
 Gorani, two singular characters from, iv. 230.
 Gordius, the, preserved alive in a dried state, ii. 285.
 Grafs farm, on the general management of one, i. A. 71.
 Grecian architecture, thoughts on its origin, ii. 187—porticos, their utility, 189—statuary, its origin in Greece, 189—gave rise to masonry, 190—marble columns, origin of, 191—changes thus produced on their colonnades, 192—private buildings little regarded, 194—nor internal decorations, 194—their architecture incomplete, and why, 194—defects in the form of their columns, 196—causes of, 198—Romans imitate the Grecian architecture and debase it, 199—a striking example of this kind, 200—freedom of remark, its utility, 201.
 Grecian and Gothic architecture compared, continued from vol. iii. 273 (v. Gothic)—architecture of a colonnade, 274—ditto of a church, 274—structures in Kew gardens, 277—the Grecian colonnade, 2 K

its excellencies, 280—and defects, 283—architecture of the India-house characterised, 284—ditto Banqueting-hall, Whitehall, 285—ditto the exterior of St. Paul's church, London, 286—Gothic style of architecture, improper use of that phrase, 383—Gothic cathedrals only valued for their internal convenience, 384—St. Paul's, London, and St. Peter's, Westminster, internally compared, 385—St. Peter's, 386—St. Paul's criticised, 387—St. Peter's at Rome, ditto, 388—Pantheon at Rome, 389—Salisbury and York cathedrals, 390—the Grecian and Gothic cathedrals compared, illustrated by a diagram, 393—the Gothic style of building, as well as the Grecian, entitled to the name of inventions, 451—resemblance of the roof, &c. of a Gothic cathedral to rows of trees, 452—ribs of the Gothic, and flutings of the Grecian columns, compared, 455—the principle held in view in Gothic ornaments, 457—variety with uniformity, 458—incongruities of the Grecian architecture, 461—St. Stephen's church, Walbrook, a striking instance of, 463—conclusion, 465.

Green-houses, a way to obtain these when wanted without expence, ii. 147.

Grub of the cock-chaffer, description of, iii. 421—lives in that state in the ground according to some four years, 422—to others six—it changes its colour a little, 423—goes deep into the ground in winter, 422—comes to the surface in summer, 425—and is then picked up by rooks, 427—435—440—hurt by the inclemency of the weather, 433—peculiarly fond of lettuce, 442—may be extirpated by rain, 442—more effectually by irrigation, 443—they may be the means of draining and of drowning ground, 443.

Grunting ox, see Chittigong cow.

Gryllus Tartaricus and migratorius, iii. 261.

Gulls useful in a garden, iii. 159.

Guinea sparrows, iii. 189—psittacus pulchellus, see Sparrows.

H.

Hairs, spines, feathers, all vegetate, i. M. 267.

Hair and wool discriminated, ii. 91—406.

Hair, that term, as applied to wool, explained, ii. 130.

Hair-bearing sheep, ii. 83.

Hair, fur, or wool, varieties of cattle respecting this particular, iii. 3.

Halfpenny's Ornaments of York Cathedral approved of, iv. 465.

Hampton Court characterised, iii. 291.

Happiness, sly observations on, iii. 139.

Harebrain, Timothy, Lucubrations of, i. M. 29—97—173—237.

Harebrain, Timothy, his Lucubrations, ii. 41.

Harebrain, Timothy, Lucubrations of, iii. 445.

Harmonic sensations, felt by man alone, i. N. 23—their importance in life, 29.

Harmonies in general defined, iv. 147.

Harper, the, a poem, ii. 309.

Hasty decisions, propensity to, censured, iii. 80.

Haystack, a remarkable one, iii. 191.

Healthy shoots, importance of, for fruit-trees, i. M. 119.

Heat of the sun, best means of receiving the full benefit of it in forcing fruit, i. M. 153.

Heat, its importance in this universe, i. N. 36.

Heat, a source of much waste of that arising from burning fuel explained, ii. 155.

Heat is produced by condensing air, and vice versa, ii. 116—125.

Heat in mines, instances of, ii. 122—127.

Heat, on the propagation of, by Air, ii. 115.

Heat above and below ground, experiments, observations, and queries, tending to ascertain the circumstances that affect them differently, iii. 271—comparative table of, 274—additional observations on, 275—apparatus for this purpose, hints to improve, 276—defects of thermometers, 277—air thermometer recommended, 281—attention to unobserved circumstances that may affect it recommended, 283—probable variations between the night and day, 288.

Hemp, on the cultivation of, in India, iii. 229.

Hen, her powerful instincts, i. N. 7.

Henry the Great, anecdote of, i. N. 26.

Heraclitus' account of himself, i. M. 110.

High life compared with those in an inferior station, i. M. 173.

Hints respecting the circumstances that require to be chiefly adverted to in experimental agriculture, &c. iii. 1—81.

Historical compositions, general observations on, ii. 445.

Historical composition, remarks on, iii. 36—the doctrine of political economy has been obscured by human reasoning, 38—would have been rendered simple by attention to one leading principle only, 39—exemplified in regard to the city of London, 40—insufficiency of reasoning for regulating political economy, 41—Facts—Billingsgate market, 43—Covent Garden

I N D E X.

I. J.

market, 42—self-interest the great moving power, 46.

Holdernefs breed of cattle, iii. 97.

Holstein horse, iv. 244.

Honey mixed with butter, its qualities, iv. 87.

Horns of deer, curious particulars respecting their growth, i. M. 201.

Hornless breed of cattle, how produced, i. N. 65.

Horn shavings, remarkable circumstance respecting that manure, i. A. 12.

Horns of all kinds vegetate, i. M. 266.

Horns of the Arnee, singular construction of, iii. 85.

Horses of Britain, how the fine breeds there have been obtained, i. N. 72— and of Arabia, 72.

Horses in England sometimes have naturally short tails, i. N. 69.

Horses, the number of those for draught about London, iv. 102.

Horse kind, on the varieties of, iv. 241— the race-horse, 241—English dray-horse, 242—Suffolk punch, 242—Lanark horse, 243—Neapolitan, Holstein, Swedish horse, 244—Iceland horse, 244—Scotch Galloways, 245—Shetland ponies, 245.

Horse-hoeing, an improved mode of, described, ii. 329.

a Horse draws four times as much in a cart as in a waggon, iv. 98.

Hot walls, mode of improving them, i. M. 153.

Hot-houses, best mode of constructing them where no artificial heat is employed, i. M. 156.

Hot-houses, notice concerning an improved mode of constructing them, iii. 481.

Houses, an easy mode of preserving them always cool in tropical climates, i. M. 210—and in polar regions during summer, 226.

Houses, how they may be warmed in cold climates without any expence for fuel, ii. 157.

Human species, its progress in knowledge advances from age to age, i. N. 10.

Human subsistence may be infinitely augmented, iv. 373.

Hume and Rousseau, difference between, i. N. 27.

Hurtful consequences that arise from discouraging agriculture, iv. 377.

Husbands, their pitiable situation described, i. M. 208.

Hydra, account of, ii. 111—figure of, 112—can be propagated by cuttings, 110—and by offsets, 112.

Hydra stentoria, how propagated, ii. 183.

Hybrid animals, valuable qualities of, iv. 329.

Jack-ass, great price of one, iv. 322.

Jamaica sheep carries fine wool, ii. 84.

Jamaica, English sheep produce wool there the same as in England, iv. 174.

Jarre, hair so called, ii. 87.

Ice, various forms it assumes under different circumstances, i. M. 10.

Ice expands at the moment of freezing, i. N. 37.

Ice-houses, how they should be constructed, i. M. 227.

Ice-house, how to construct one as an appendage to the dairy, iii. 412.

Iceland, a spirituous preparation of whey there, iii. 345.

Iceland horse, iv. 244.

Ichneumon fly lives one day only, but as a water worm two years, i. N. 16.

Ichneumon, varieties of, iii. 202—ditto *inserens*, *tipulae*, *penetrans*, *manifestator*, 264.

Iceicle, its particular structure, i. M. 47—hoar frost, its organization, i. M. 17.

Jericho, rose of, noticed, ii. 275.

Ignorance, an apology for, ii. 65.

Implements of agriculture enumerated, i. A. 42.

Implements of agriculture, on the improvement of, iv. 104.

Impossibilities have been often performed—various instances of, i. M. 191.

Improvements in agriculture have been of a local nature, and why, i. A. 4.

Inclosures classed, i. A. 42.

Income tax, strictures on, ii. 50.

Incongruities of Grecian architecture, iv. 461.

Index Indicatorius, i. M. 279—288.

Index Indicatorius, ii. 220—310—397—470.

Index Indicatorius, iii. 78—155—237—310.

India-house, the architecture of, characterised, iv. 284.

Indians in America, interesting remarks on their manners, iii. 305.

India, cattle of a small size, iii. 88.

Indian weed, iii. 314.

Indian weed supposed to be an animal substance, iv. 395—confirmed, 477.

Indian breeds of sheep, ii. 166.

Indigo, the rearing of, introduced in India, ii. 216.

Infant, an, the most helpless of all animals, i. N. 8.

Insects, a general view of the important part assigned them in this universe, i. N. 13—their irresistible power, 13—their utility to man, 14—act as humble scavengers in their reptile state, 14—in their fly state, 16.

Insects, the period of their existence in their different states, i. N. 16.

I N D E X.

Insects, a remarkable instance of the consequence of not destroying them on fruit-trees, i. M. 73.
Insects, instinct of, in depositing their eggs, ii. 26.
Insects, general observations on, ii. 349.
Insects, their importance in the universe, iii. 259.
Insectivorous insects, observations on, iii. 256.
Insect, one that hatches its eggs, and covers its young like a hen, iii. 354.
Instinct, how it differs from reason, i. N. 5.
Instinct is often most powerful among animals whose rational powers are weakest, i. N. 7.
Instinct in man less obvious, i. N. 8.
Intercolumniation, the circumstance that gave rules for this in Greece, ii. 192.
Internal decoration neglected in Greece, ii. 194.
Inventive genius of the Greeks not suffered to be exerted on their architecture, and why, ii. 194.
Invention, what the meaning of it in architecture is, iv. 451.
Internal tranquillity of a state, how it can be best attained, iv. 380.
Jockeys and sportsmen, their mode of breeding animals applauded, i. N. 72.
Joumarre, a hybrid animal, described, iv. 331.
Iron vessels for the dairy disapproved, iv. 3.
Iron cast rail-ways, see Rail-roads.
Irrigation, new experiments on, i. M. 251.
Judging, premature, condemned, i. M. 191.
Julia to her friend in town on the beauties of nature, i. M. 38—continued, 149—continued, on the pleasures of poetry, 255.
Juvenis, his queries respecting nettle cloth, iii. 147.

K.

Keelmann, his observations on the grub, iii. 435.
Kemps, hair so called, ii. 87.
Kermes insect, with a figure, iv. 36.
Kew Gardens, buildings of, characterised, iv. 277.
Kiloe cattle considered as to size, iii. 88—as to milk, 94.
King of Madagascar, singular traits of native equity and generosity in his character, ii. 229.
Koumiss, a spirituous liquor obtained from milk, iii. 342.

L.

Laine rouge de Carmanie, ii. 247.
Lambe, C. his poetical description of a

forest life, iv. 236—general lover, 237—fragment of a dialogue, 237.
Lambs, varieties of sheep that nurse them best, ii. 246—some breeds produce more than others at one birth, 246.
Lambs skins, Boucharian, a fine fur, ii. 90.
Lammermoor breed of sheep, ii. 104.
Lanark horse, iv. 243.
Language of agriculture imperfect, i. A. 2.
Language, the, of natural history, being now fixed, we are at liberty to proceed in that study, i. N. 2.
Large cuttings of potatoes planted as seeds produce the largest crops, iv. 252.
Large machines proportionably weaker than small ones, iv. 95.
Largesses the cause of national destruction, iv. 470.
Larva, the meaning of that term, i. N. 15.
Larvæ of insects, what, ii. 28.
Lathbury, P. his experiments, iii. 271.
Lazzaroni of Naples, curious account of, iii. 221.
Lead rubbish produces the arenaria verna, i. A. 9.
Legislators misled by merchants and manufacturers, iv. 381.
Leith horses, the surprising load they draw, iv. 101.
Leicester breed of sheep, ii. 104.
Letter from General Washington, ii. 466.
Lettuce, a favourite food of the grub, iii. 441—planted as a trap for it, 442.
Lewcombe oak, i. N. 95.
Lichen propagates after being dried, ii. 64.
Life of every animal a state of warfare, i. N. 83.
Linden Tree, the, poetical address to, iii. 301.
Lines for fishing improved by coutchouc, iii. 77.
Linnaeus, his System of Nature most esteemed, i. N. 2.
Liquid measures octally divided, iv. 444.
Live stock, different kinds that may be occasionally kept by the farmer, i. A. 60—economical considerations concerning them, i. A. 67.
Load of each horse in a waggon and single horse cart compared, iv. 97.
Load of a horse on iron rail-ways from 10 to 43 tons, iv. 201.
London carts clumsy and inconvenient to a wonderful degree, iv. 107.
London cow-keepers, their barbarous mode of management, iii. 242.
Love, cause of the different ideas that different persons annex to that phrase, i. N. 25.
Lucubrations of Timothy Harebrain, iii. 444.
Lucubrations, vide Harebrain.
Lucullus, his extravagance, iv. 468.

I N D E X.

M.

McDonald, Lord, anecdote of, iv. 229.
Machines of a small size proportionally stronger than larger, iv. 95.
McLaurin, interesting anecdote of, iii. 152.
Madagascar, some account of, by one of the persons wrecked in the Winterton, ii. 140—government, 148—character of the inhabitants, 225—ditto of the king, 229—their religion, 294—nature of the country, 259—animal productions, 259—climate, 298.
Magnitude and simplicity of form constitute essentials in the idea of grandeur in artificial structures, iii. 197.
Males of the coccus tribe of insects have wings, iv. 24.
Man is greatly superior to all other animals on this globe, i. N. 4—the only animal which knows how to cultivate plants, N. 18—the only animal who is susceptible of the power of beauty, harmony, and perfumes, N. 19—is capable of receiving two kinds of impressions through the same organ, N. 20—he alone is susceptible of harmonic sensations, N. 25—and of the moral sense, N. 25.
Man, his power over animals, by observing their individual instincts, some striking instances of, i. N. 10.
Management of land, general disquisitions concerning, i. A. 77.
Manna, name given to the showers of ephemera flies, iii. 31.
Manufacturers discriminate clays more accurately than farmers, i. A. 6.—consequences of this, 7.
Manufactures, the prosperity of, a political disease, iv. 157.
Manufactures compared with agriculture, see Comparative view.
Measures of length octally divided, iv. 443—of liquids ditto, 444.
Meat, the different qualities of it in different breeds of the same animal, iv. 167.
Mechanical chemists, iii. 360.
Medicated butter, how to prepare, iv. 87.
Metallic vessels in the dairy, danger of, iv. 2.
Method of preventing a heated wall from experiencing variations of temperature, i. M. 166.
Mètre, French, imperfections of, iv. 432.
Metrical system in France, observations on by professor Byggé, iv. 428—great imperfections of, 433—hints of a better device for that purpose, 437.
Mice, white, how produced and perpetuated, i. N. 63—and how lost, 64.
A Middle station productive of more happiness than high rank, i. M. 174.

Migration of fishes, thoughts on the cause of, i. M. 174.
Milk, destined by nature for nourishing viviparous animals, ii. 25—475.
Milk, circumstances which produce a variation of, ii. 245.
Milk, eoutchouc juice resembles it, iii. 69.
Milk, disquisitions on the difference that takes place respecting it in different breeds of cattle, iii. 163—that of ewes, cows, and goats, wherein they differ, 164—a cow whose milk afforded no cream, 168—diversity respecting long or short continuance in milk, 167—in respect to richness, 168—in respect to quantity, 170—quantity of, how it may be augmented, 249.
Milk, general aphorisms respecting the circumstances that affect the separation of cream from, iii. 321.
Milk, inquiry respecting that kind which is fittest for making cheese, iii. 335.
Milk, a singular circumstance respecting such as is affected by a peculiar taste, iii. 340.
Milk, constituent parts of which it consists, iii. 341.
Milk cows, remarkable breeds of, iii. 94.
Milk-house, directions how to construct one of a very perfect kind at little expence, iii. 402—how to ventilate it, 407—and preserve an equality of temperature in it, 408—proper heat of, 415.
Milking cows, attentions necessary respecting this circumstance, iii. 248—necessity of doing it in a gentle manner, 255.
Milton's forte was not the tender, but the sublime, i. M. 201.
Mind, its influence on animal motion considered, ii. 380.
Mineralogical society, notices of, ii. 398.
Minerals, the important place they hold in this universe, i. N. 29.
Minutes respecting the construction of iron rail-ways, iv. 473.
Mira, answer to, observations on poetry, i. M. 148.
Mira, voluntary by, iii. 137.
Mistletoe, how to extirpate it, i. M. 74.
Mixed breed of sheep, Spanish and English, the qualities of, iv. 180.
Mode of constructing houses that shall be cool in warm climates, i. M. 210.
Model of St. Paul's church characterised, iii. 292.
Moderns induced to class natural objects on account of their ignorance of the writings of the ancients on that subject, i. N. 1.
Moisture extracted from mould by means of frost, i. M. 27.
Mongrels, among vegetables, instances of,

I N D E X.

i. N. 87—instanced in regard to cabbages, 88—and turnips, 89—how they differ from mongrel animals, N. 90.
Money, the pleasures it promises fallacious, i. M. 121.
Moral sense, what, i. N. 25.
Moss upon trees, a vegetable propagated by seeds, and may be extirpated, i. M. 73.
Moth, the domestic, history of, iii. 176—in its larva or caterpillar state destroys woollen goods, feathers, &c. 178—forms a case for itself, 178—its case may be tinged at pleasure with different colours, 179—how it may be killed, 82—its excrements tinged by its food, 184—may be employed as a pigment, 185.
Mouldiness, thoughts on, i. M. 127.
Mouldiness, particulars respecting its propagation, ii. 265—the seeds of, resist a surprising degree of heat, 265.
Mountainous countries best adapted for producing cheese—valleys butter, iii. 64.
Mules of Britain, iv. 330—of Spain, 331.
Musca chamæleon, see *Chamæleon*.
Musca vomitoria et carnaria, iv. 261.
Music, the power of, beautifully described by Milton, i. M. 199.
Musk on Hudson's Bay affords silky wool, iii. 14—figure of, 17.
Myrmelion formicaria, see *Formica-leo*.

N.

Naiad, its singular mode of propagating, ii. 100.
Nasse, polype en, how propagated, ii. 185.
Natural history, definition, i. N. 1—was studied at an early period, ib.
Natural history, pleasures attending the study of, i. M. 39.
Natural history, cautions respecting it, i. M. 265.
Natural history, ii. 21—95—126—253—349—409.
Natural history, iii. 18—101—170—257—349—420.
Natural history, transformations of the coccus tribe, iv. 17—*chamæleon* fly, 186—rat-tailed larvæ of flies, 112—viviparous flies, 260—tenacity of life of some insects, 269—burial of the mole, 344—Indian weed, observations on, 395—477.
Natural objects arranged under three classes, i. N. 3—these are so nearly connected, as not to be easily distinguished from each other, N. 3—in regard to mental powers, as well as corporeal organization, N. 3.
Natural physics, what, i. N. 32.
Nature, her operations tending to meliorate the soil, i. A. 40.

Neapolitan horse, iv. 244.
Negro fishes of China, iii. 457.
Needle-like spicule of ice, how produced, i. M. 18.
Nelson, Lord, his egrette described and delineated, i. M. 96.
Netherlands, the, an agricultural survey of it proposed, i. A. 25.
Nets for fishing made of coutchouc, iii. 75.
Nettle hemp, inquiries after, by Juvenis, iii. 147—answers to, by the Editor, 149.
Neuter bees, what, ii. 35—can be transformed into females, 38.
Nightingale, curious mode of obtaining food for, in Russia, iv. 158.
Nomenclaturists, philosophers of that sect criticised, iii. 362.
North American Indians, remarks on, iii. 303.
Norfolk sheep, ii. 111.
Nostoc revives after being dried, ii. 262.
Notice to the readers, iv. 319.

O.

Oats, varieties of, specified, ii. 11.
Oats, supposed transmutation of, intorye accounted for, ii. 238.
Obelisks of Egypt, iii. 119.
Observer, his remarks on the various breeds of sheep, &c. ii. 401.
Obstructions to the operations of agriculture enumerated, i. A. 39.
Octal division of weights and measures, conveniency of, iv. 438—mode of notation on that plan, 440—multiplication table on that system, 442—measures of length on ditto, 443—liquid measures ditto, 444—coins ditto, 446—amazing facilities this system would produce in calculations, 447.
Ode to the river Cam, ii. 77.
Ode to Dr. R. Anderson, iv. 79.
Oestrus aquæ, see *Chamæleon* fly.
Oily matter, one of the constituent parts of milk, how separated, iii. 341.
Ointment discovered by Mr. Forsyth for healing wounded trees, its efficacy, i. M. 70.
Old trees may be made to bear fruit much sooner than young ones, i. M. 77.
Old words, utility of retaining them, iii. 298.
Oliver Oldstyle, his sly remarks on domestic economy, ii. 205.
Onions raised successively on the same spot for time immemorial, i. A. 25.
Operations by art upon the soil, to prepare it for carrying corn, specified, i. A. 39.—ditto by *nature*, for the same purpose, 40—ditto calculated for extirpating weeds, 41—ditto calculated to guard against trespasses, 42.

I N D E X.

Opossum, singular mode of nourishing its young, ii. 32.
on Orchards and fruit-trees, i. A. 58.
Organization of plants to be adverted to, i. N. 28.
Organicus on the senses, iii. 468.
Ornaments, Gothic, principles of their composition, iv. 457.
Osier, its bark converted into paper, iii. 315.
Otaheitean cloth, iii. 315.
Otter, a tame one described, i. M. 104—method of training it, 106.
Oviparous animals, what, ii. 22.
Ox, the, considered as a beast of burden, iv. 162.

P.

Paintings, to preserve, by being hermetically sealed up between two coats of coutchouc, iii. 204.
Painting on a singular substance, iv. 398.
Palemon, answer to, concerning original matter for this work, i. M. 47.
Palluel, Cretté, notices of, i. M. 35.
Palm-trees, uses of their filamentous wood, iii. 315.
Pantheon characterised, iii. 199.
Pantheon at Rome further characterised, iv. 389.
Paper, surprising advance in the price of, ii. 440—474.
Paper, mulberry, iii. 315.
Paper, plants that can be converted directly into paper, iii. 314.
Papilionaceous flowers may be made to yield mongrel varieties, i. N. 92.
Parry, Dr. his experiments on the improvement of British wool, iv. 171.
Parson, a country, his observations on manufactures and agriculture, iv. 36.
Particular plants affect particular soils, remarkable instances of, i. A. 14.
Party politics excluded from this work, i. M. 46.
Paste of flour, the animals of, preserved alive in a dried state, ii. 255.
Pastoral poem to the spring, iii. 137.
Pastoral poetry, remarks on, iii. 389.
Pastoral state of society limited for food, iv. 373.
St. Paul's church, London, characterised as an object of taste, iii. 199.
St. Paul's church criticised exteriorly, iv. 286—interior, 387.
Peach-tree coccus, account of, iv. 19.
Peach-trees, blight of, explained, iv. 26.—how to prevent, 29.
Pediment, origin of, ii. 188.
Periodical performances, hints on the utility of, i. M. 87.
Permanent change of a soil produced by a very small addition made to it, i. A. 15.
Permanent changes in the breed of sheep can only be effected by blood, iv. 180.

St. Peter's, Rome, criticised, iv. 388.
Phalæna grosulariata, notices of, ii. 135—figure of, 279.
Phalæna tineæ pelionella, see Moth.
Phenomena of frost, i. N. 38.
Phenomenon of frost, a singular one accounted for, ii. 129.
Philo, and answer to, on the plan of this work, i. M. 43.
Philosophers, their opinions ought to be little regarded by practical men, i. N. 71.
Philosophers bad regulators of political economy, iii. 138.
Philosophers, their propensity to idolise great names without consideration, iii. 366.
Philosophos on political economy, i. M. 46.
Philogynes on female profligacy, i. M. 205.
Phlogistonian chemists, iii. 361.
Physical decisions, cautions respecting them, iv. 48.
Piazzas in Covent Garden an example of the good taste of Inigo Jones, ii. 198.
Pigment of a very fine sort, how to be obtained, iii. 185.
Pilasters condemned, ii. 201.
Pinnacles, uses of, ii. 430.
Pipa, see Toad.
Plagiarism and Plagiarists, observations on, iii. 208—a strong coincidence ~~ought~~ may take place without any communication, 210—instance of, with respect to Dean Tucker's Cui Bono, 210—and a Young Inquirer, 212—even in thoughts, words, and phraseology—a striking instance of, by the Editor, 213—various other instances of, 216.
a Plain Man, his observations on the horns of deer, i. M. 260.
Plants thrown out of the ground by frost, how affected, i. M. 21.
Plants that sport, observations on, i. N. 94.
Plants that resume life after being long in a dry state—*nostoc*, ii. 262—*byssus*, 263—*tremella*, 264—*lichen*, 264.
Poetry, the charms of, by Julia, i. M. 255.
Poetry, observations on, i. M. 141—cautions to young writers concerning it, 143.
Poetry, its genuine characteristic feature pointed out, i. M. 203.
Poetry, descriptive remarks on, iii. 388.
Poetry—to the violet, i. 71—ode to Dr. R. Anderson, 79—song for seventy, 150—forest life, 236—general lover, 237—fragment of a dialogue, 237—the snow-drop, 238.
Poker, query whether it makes the fire burn when laid across it, iii. 157.
Poisonous plant, an unknown one in North America, alarming effects of, i. M. 234.
Politeness between American savages and

- civilised Europeans; contrasted, iii. 306.
- Polypus tribe, account of, ii. 108—it may be propagated by cuttings, 110—also by offsets, 112—propagate by natural division, 177—tunnel polypus, 183—polypus propagated by a kind of eggs, 184—sea anemone, 185.
- Pope Benedict XIV. anecdote of, iii. 316.
- Pope, Mr. Castigator's defence of him, i. M. 194.
- Population, an agricultural state more favourable to it than a commercial or manufacturing nation, iv. 368.
- Populousness of ancient states, iv. 379.
- Porpoises destroyed by a very easy contrivance, i. N. 11.
- Porticoes, Grecian, great conveniency of, ii. 189.
- Post-horse, an affecting picture of, ii. 396.
- Potatoes, an economical preparation of, ii. 319.
- Potatoe, history of the introduction of its culture into Europe, ii. 380.
- Potatoes, rearing them from sprouts recommended, iv. 247—the utility of, questioned, 248—experiments on the rearing of the plant stated, 249—the quantity produced from an acre by different modes of planting, 253—further observations on the mode of rearing potatoes, 255—a premium for obtaining the best sort proposed, 258.
- Potatoes, rearing from shoots uneconomical, iv. 425.
- Potatoes, some kinds much more productive than others, iv. 256.
- Potatoes, an easy mode of forcing them early, iv. 334—Figure illustrative of, 343.
- Poultry, coloured, how to be accounted for, i. N. 65.
- Power, the, of instinct greatest among animals whose reasoning faculties are moderate, i. N. 7.
- Premium, a very high one proposed for discovering a potatoe possessing certain qualities, iv. 258.
- Prejudice against agricultural writings, how produced, i. A. 20.
- Preservation of animal life, singular modes adopted by nature,—of snails preserved by desiccation, ii. 253—ditto insects of flour paste, 255—ditto the gordius, 255—ditto rachitic wheat, the animal of, 255—ditto the wheel insect, 257.
- Principles of agriculture, the true, explained, iv. 417.
- Prisons, how they may be kept sweet, and warmed by the action of the sun only, iii. 418.
- Private property, evils that result from making canals and rail-ways such, iv. 222.
- Profit to be derived from different breeds of sheep, iv. 118.
- Proportion of wool on different breeds of sheep, iv. 177.
- Prosperity of manufactures a political disease, iv. 137.
- Propagation and preservation of animated beings, on the various ways adopted by nature, ii. 21—large animals are all susceptible of sex, 21—of quadrupeds, 22—birds, 23—insects, 26—fishes, 30—frogs, 30—Surinam toad, 31—opossum, 32—the bee, 33—the aphides, 95—the earthworm, 97—other vermiform insects, 98—animalcula infusoria, 104—polypus, 108—vorticella umbellaria, 176—ditto anastatica, 176—hydra stentoria, 188—polype en-nasse, 184—sea anemone, 184—revivification of snails, 253—of the gordius, 255—of the wheel insect, 257—of fishes in India, 259—of the nostoc, 262—byssus, 263—tremella, lichen, 264—mould, 265—caterpillars, 266—flies and bees, 271.
- Provisions, on the high price of, cautions respecting the mode of judging of, iv. 221.
- Prussia, the king of, his kindness to M. d'Alembert, iii. 52.
- Puceron, black, of the bean, mode of destroying it, i. M. 188—confirmed, 259.
- Pucerons, see Aphides.
- Pyramids of Egypt, iii. 119.
- ## Q.
- Quarry, a singular one, iii. 451.
- Quality of the potatoe is not connected with its productiveness, iv. 257.
- Queries, suggestions, and observations, by B, i. M. 249.
- Queries respecting some animals mentioned by Caesar, ii. 72.
- Queries respecting the mode of obtaining water on a farm, iv. 152.
- Quirinal garden, meeting of Charles the Third and Pope Benedict XIV. in, iii. 326.
- ## R.
- Rabbits with one ear only, i. N. 68.
- Race-horse of England, iv. 241.
- Rachitic wheat, the insect of, ii. 255—preserved alive in a dried state, 255.
- Rail-ways, notices of such as have been already constructed, iv. 200.
- Rail-ways, observations on the great utility of, iv. 198—directions for forming them, 473.
- Ramiparous animals, what, ii. 111.
- Rat-tailed larva of flies, account of, iv. 113—figure of, 126.
- Readers, the, notices to, i. M. 190—288.
- Readers, to the, iii. 78.
- Readers, to, on the vexatious interruptions respecting this work, iii. 487. iv. 478.

I N D E X.

Reading memorandums, iv. 400.
 Reason and instinct, how to be differ-
 enced, i. N. 5.
 Reason among brutes, how far percep-
 tible, i. N. 9.
 Reasoning, the art of, iii. 359—examples
 of defective systems of reasoning that
 have been fashionable for a time—of
 the Rofsicrucians, 360—mechanical
 chemists, 361—phlogistonians, 361—
 nomenclaturists, 362—defects of that
 system of reasoning pointed out in a
 particular manner, 368.
 Reasoning, on the art of, iv. 217.
 Rebellion, domestic, humorously com-
 pared with political rebellion, i. M. 206.
 Recluse, the, a singular character, notices
 of, i. M. 32—continued, 49—conti-
 nued, 97.
 Rein-deer described, iii. 463.
 Retaining milk, a singular faculty pos-
 sessed by cows, iii. 255.
 Revenue of a state, how it may be easily
 augmented, iv. 465.
 Reynolds, sir Joshua, experiments by,
 ii. 8.
 Rich, the, proposals for bettering their
 condition, iv. 64.
 Richness of cheese, disquisitions respect-
 ing what that term means, 331—does
 not depend on the quantity of cream
 in it, 332—nor on the softness in toast-
 ing, 332—but on the mode of making
 it, 333.
 Ricketty, vide Rachitic.
 Robber, an extraordinary one, iii. 133.
 Robin and Susan, a jeu d'esprit, i. M.
 237.
 Roegel, his account of the *Scarabæus*
Melolontha, iii. 434—his industry
 commended, 436.
 Romans debased the architecture of
 Greece, ii. 200—exemplified in the
Colisæum, 200.
 Romans, the errors of their system of po-
 lity, iv. 468—their extravagance, 468.
 Roofs of houses made of coutchouc, iii.
 73.
 Roof of a Gothic cathedral resembles a
 grove of trees, iv. 452.
 Roots of plants, in what way they op-
 erate in meliorating the soil, i. N. 38.
 Rope, loose, said to preserve trees from
 frost, i. M. 26.
 Rose of Jericho noticed, ii. 273.
 Rofsicrucian philosophers, iii. 360.
 Rotifer can be revived after remaining
 many years inactive in a dry state, ii.
 257.
 Rotunda, see Pantheon.
 Rousseau and Hume, difference of, i. N.
 27.
 Roxburgh, Dr. his botanical description
 of the *Urceola elastica*, iii. 376.
 Vol. IV.

Ruins, circumstances that constitute
 grandeur in them, iii. 200.
 Rules for selecting the best breeds of ani-
 mals, i. N. 81.
 Rural hints and lucubrations, by a rural
 villager, i. M. 145.
 Rural sports, a strange perversion of the
 term, iii. 461.
 Russia, empress of, her kindness to M.
 d'Alembert, iii. 51.
 Ryeland sheep make a good cross with
 those of Spain, iv. 175.

S.

Saccharine part of milk, iii. 341—its qua-
 lities, 342—can be converted into ar-
 dent spirits, 342—caseous part of milk,
 342.
Salix pentandria, the wood of it may be
 made into paper, iii. 316.
 Salisbury cathedral, iv. 390.
 Salmon infested by insects, i. M. 126.
 Salt, common, experiment on, as a ma-
 nure, i. A. 13.
 Salted butter, best vessels for that use, iv.
 82.
 Sands, loose, a plant recommended for fix-
 ing them, ii. 221.
 Sardinian als remarkably small, iv. 328.
 Sarluc, see Chittigong cow.
 Saving, great, that would result from the
 use of carts in place of waggons, iv.
 102.
 Saunterer, his walk through London,
 iii. 367.
 a Saunterer, his observations, i. M. 241.
 —his proposal for teaching watchmen
 to sing, 245.
 Savages of America, remarks on, iii. 303.
 Scab in sheep, a cure for, iv. 104.
Scarabæus Melolontha, iii. see Cock-chaffer
 Schirach, Mr. his curious discoveries on
 bees, ii. 38.
 Science, what this word means, i. A. 3.
 Scotticisms and Anglicisms, a list of, iii. 54
 —bundle, byre, cow-house, 55—inex-
 pressibles, 56—Highlander's, Highland
 scot, 57—good bye, 59—parallality,
 straightality, levelity, 61—bodkin, 294
 —to scale, 295—hung, hanged, 299
 —hang, hing, 300.
 Scotticisms and Anglicisms, observations
 on, ii. 434.
 Sea grafs, or Indian weed, iii. 314.
 Seeing things in different lights, utility of,
 iii. 472.
 Self-adulation, the delusions of, iii. 363.
 Selecting the best breeds of animals, rule
 for, i. N. 81.
 Seminal varieties, what, i. N. 94.
 Serous part of milk, ii. 341.
 Serous part of milk hurtful to cream, iv.
 6.

I N D E X.

- Seratella* moth, account of, ii. 409.
 Sexes, all large animals are susceptible of that distinction, ii. 21—species of three sexes, 32—aphides generate without any males, 95.
 Sheep, why they are for the most part white, i. N. 65.
 Sheep, varieties of, ii. 81—is not necessarily a wool-bearing animal, 82—various examples of short-haired sheep, 83—Argali, 84—Jamaica sheep, 84—Cape sheep, 89—the fat-rumped sheep of Asia, 89—Boccharian sheep, 89—Finland ditto, 90—Spanish ditto, 94—Shetland ditto, 94—Cornish ditto, 162—South down ditto, 164—diversities of, in regard to size, 169—additional observations on the various breeds of, by Observer, 401.
 Sheep, one half of those reared carry hair, and not wool, ii. 167.
 Sheep, a ludicrous instance of an instinctive bias of, iii. 366.
 Shelter necessary for milch cows, iii. 246.
 Shells of crustaceous fishes, observations on, i. M. 268.
 Shetland goose, its peculiar delicacy, ii. 242.
 Shetland poney, a beautiful breed of very small horses, iv. 245.
 Silk-worm, its transformations, i. N. 16.
 Silk, account of its introduction into Europe, ii. 378.
 Silk-worm, its eggs bear much more cold than the caterpillar, ii. 268.
 Silk-worm, the Chinese, the rearing of it introduced into India, ii. 215.
 Silver fishes of China, iii. 457.
 Simplicity of manners, beneficial effects of, on a people, iv. 369—contrasted with corruption, 371.
 Sinclair, sir John, his attempts to improve British wool, iv. 173.
 a Single horse draws a load of $1\frac{1}{2}$ tons, iv. 100.
 Sira, a spirituous liquor obtained from whey, iii. 345.
 Size of animals does not depend on the food, ii. 16.
 Size of animals depends upon the breed, ii. 171.
 Size, diversity in regard to this particular between different breeds of dogs and sheep, ii. 169.
 Skins of Shetland sheep fine leather, iv. 165.
 Sleeping-chambers in tropical regions, where they should be placed to be the most wholesome and refreshing, i. M. 225.
 Sleeping animals, observations on, ii. 254.
 Slugs, observations on, by a Young Inquirer, iii. 166.
 Slugs, farther observations on, iii. 475—probably they lie dormant in dry weather without requiring food, 478.
 Small-sized animals, advantages in rearing them, iii. 91.
 Small estates, beneficial tendency of, ii. 62.
 Snails, individuals are of both sexes, ii. 95.
 Snails, preserved many years *alive* in a dried state, ii. 253.
 Snails lie motionless, and probably without food, during dry weather, iii. 479.
 Snake, bite of, cured by volatile alkali, iii. 224.
 Snow-drop, address to, iv. 238.
 Snow, flake of, its particular stricture delineated, i. M. 28.
 Society for bettering the condition of the *Rich*, report of, iv. 54.
 Society for improving British wool, how instituted, iv. 173.
 of Soils, i. A. 35.
 Soils, how produced, i. A. 5.
 Soils affected by particular manures that do not fertilize others, instances of, i. A. 12.
 Soil, fertilized by the destruction of animals and vegetables, i. N. 131.
 Solid substances of every sort may be converted into mould, i. A. 8.
 Solomon, his wealth, sources of, iv. 467.
 Song for seventy, iv. 150.
 South-down sheep, ii. 164.
 Spain, causes of the loss of its manufactures, iv. 292.
 Spandrils, uses of, ii. 433.
 Spanish breed of sheep, ii. 94—figure of a ram, 114.
 Spanish sheep carry wool equally fine in Britain as in Spain, ii. 172.
 Spanish sheep, their wool does not degenerate when they are reared in England, iv. 175.
 Spanish ass remarkably large, iv. 326.
 Sparrows destructive to gooseberries, ii. 137—and pease, 139—hints tending to mitigate this evil, 139.
 Sparrows, Guinea, remarkable affection of, iii. 189.
 Sparrows, waste done by them, iv. 12.
 Species, the knowledge of, does not advance among mere animals, i. N. 9.
 Spice trees now generally diffused over India, ii. 216.
 Spires and spiral towers, iii. 121.
 Spirituous liquor obtained from milk, iii. 342—how this may be obtained, 343.
 Spontaneous generation, circumstances that might give rise to that opinion, ii. 265.
Sporting of plants, observations on, i. N. 94.
 Springs, the origin of, i. N. 39.
 Spring, to the *a* voluntary, iii. 137.

I N D E X.

Sprouts of potatoes, mode of propagating them, vide Potatoes.
Stag, the, an account of one, i. M. 59.
Staggers, a disease among horses and other animals, so called, observations on, i. M. 229.
Staggerweed, a plant so called from its deleterious effects when eaten by animals, i. M. 235.
Steatopyga, or fat-rumped sheep, ii. 89.
St. Stephen's church characterised, iv. 463.
Stones, &c. converted into soil, i. N. 35.
Stove, how to obtain one without occasioning any waste of fuel, ii. 155.
Strasburgh, its fine spire, iii. 122.
Strawberries destroyed by the grub, iii. 442—how they may be saved, 442.
St. Giles's church, Edinburgh, its fine spire, iii. 124.
Sublimity, see Grandeur.
Subsistence for man may be augmented infinitely by means of agriculture, iv. 373.
on Substances that render soil infertile, i. A. 37.
Succulent food in winter necessary for cows, iii. 243.
Suffolk punch horse, iv. 242.
Suffolk cows, iii. 98.
Sugar, a powerful antiseptic, iii. 87.
Sully, remarkable anecdote of, i. N. 26.
Survey, an agricultural one of Britain proposed on a new plan, i. A. 23—and of the Netherlands, 25.
Surinam toad, vide Toad.
Swedish horse, iv. 244.
Swine feeding in the woods, a natural picture of, iii. 392.
Synopsis of a systematic arrangement of the several objects that ought to be adverted to by an agricultural inquirer, i. A. 34—I. on vegetation in general, 34—II. of soils, 35—III. substances that tend to render the soil infertile, 36—IV. manures, 37—V. obstructions to the operations of agriculture, 39—VI. operations *by art* for rendering the soil fit for carrying corn, 39—VII. ditto of nature, 40—VIII. ditto calculated for extirpating weeds, 41—IX. ditto calculated to guard against trespasses, 42—X. of implements employed in agriculture, 43—XI. general disquisitions concerning vegetables, 48—XII. ditto concerning animals, 53—XIII. of the culture of vegetables in general, 55—XIV. ditto of particular crops, 57—XV. on orchards and fruit trees, 58—XVI. timber trees considered as a crop by the farmer, 59—XVII. of the different kinds of live stock that may be occasionally kept by the farmer, 60—XVIII. economical considerations respecting live

stock, 67—XIX. on the general management of an arable farm, 67—XX. ditto of a grass farm, 71—XXI. on the choice and management of an unimproved farm, that is meant to be converted into tillage, 74—XXII. general disquisitions concerning the management of land, 77—XXIII. buildings necessary for a farm, and their appurtenances, 78—XXIV. considerations respecting fuel, 80—XXV. accidents to which the farm is liable, 81—XXVI. diseases to which particular crops are liable, 83—XXVII. on the diseases of domestic animals, 83—XXVIII. observations on the weather, and rules for judging beforehand of the changes which are likely to happen, 84—XXIX. general observations on the circumstances that tend to retard or accelerate the progress of agriculture, 85—XXX. agriculture considered as an object of taste and recreation to a man of fortune, 90—conclusion, 91.
Systematic synopsis of agriculture, i. A. 34.
System of architecture, impropriety of that term, iv. 274.

T.

Tan not necessary in stoves, iii. 485.
Tanks of water, queries respecting, iv. 152.
Tarello, his treatise on agriculture, iv. 401.
Tartary, a spirituous preparation obtained from milk there, iii. 342.
Taste of milk, a singular peculiarity respecting it, iii. 340.
Taste, the meaning of that word, i. N. 23.
Taste, reflections on, i. M. 269.
Taste of the flesh depends upon breed, ii. 242.
Taste, hints respecting, iv. 137—it admits of a twofold meaning, 141—defined, 143—harmonies, what, in matters of taste, 147.
Tatham, colonel, his account of Columbus, iv. 61.
Tax upon income, strictures on, ii. 56.
Tenthredo fly produced from the gooseberry caterpillar, ii. 136.
Tenthredo grosulariata, account of, ii. 275—figure of, 273.
Thalictrum cornutum, an elegant plant, iii. 449.
Thermometers, difficulty of making them correct, 277—quicksilver, its defects and advantages, 277—apparatus described for making thermometrical observations correctly, 281—air thermometer described, 282—hints for perfecting it, 285.

I N D E X.

Thibet, the bushy-tailed bull of, see Yak.
 Thibet goat, ii. 326.
 Thomson, verses resembling his where there could be no plagiarism, iii. 214.
 Tiara, the Roman, the top of a spire at Edinburgh resembling it, iii. 124.
 Tick in sheep, mode of destroying it, iv. 104.
 Timber trees considered as a crop by the farmer, i. A. 59.
 Time, the French division of, improper, iv. 481.
 Timothy Harebrain, Lucubrations of, iii. 444.
 Timothy Harebrain, vide Harebrain.
 Toad of Sujinam supports its young on its back, ii. 31.
 Tobacco smoke kills the woollen moth, iii. 182.
 Tom, the smallest breed of cattle, only two feet high, iii. 86.
 Touching, the art of, iii. 474.
 Trade compared with agriculture, vide a Comparative view.
 Transformations and other peculiarities of insects, instances of, the ephemera fly, iii. 18—ditto of the formica-leo, or lady-fly, 100—of the domestic moth that eats woollen goods, 176—the earwig, 349—the cock-chaffer fly, 420.
 Transformations and habits of insects, on the, iv. 17—113.
 Translations, observations on, ii. 311.
 Travelling memorandums, i. M. 23.
 Trees, benefits that may be derived from a careful attention to varieties obtained from seed, i. N. 64.
 Tremella revived after being-dried, ii. 264.
 Turnips, mongrel varieties of, i. N. 89.
 a Tun weight the usual load of a single small horse in a cart, iv. 101.
 Turnpike roads, comparison between those and iron rail-ways, iv. 207.
 Tuscany, duke of, his benevolent but defective legislative operations, iv. 217—329.

U. V.

Ulex Europæus, the best winter food for cows, iii. 244.
 an Unimproved farm, on the choice and management of, i. A. 74.
 Urus, notices of, ii. 75.
 Useful vegetable productions scarcely known, a list of, ii. 223.
 Utensils of the dairy, on, iv. 1.
 Utility of periodical performances, i. M. 8.
 Value of the wool of different breeds of sheep, iv. 178.
 Vanbrugh, sir John, his structures reach not the sublime, but are picturesque, and why, iii. 293.
 Varieties of animals, a dissertation on, i.

N. 49—how distinguished from species, 50—supposed to have been all produced from one parent stock, 51—proved to be an erroneous opinion, 52—individuals are not changed by climate, 53—nor their progeny, 54—changed by an intermixture of blood producing mongrels, 57—varieties in their natural state keep distinct from each other, but intermix in a domesticated state, 57—manner in which they are induced to keep apart from each other, 59—natural varieties are not a casual but a permanent distinction, 61—lesser varieties, called *families* or *breeds*, how they differ from the others, 62—the origin of *breeds* purely accidental, but when once obtained may be perpetuated, 62—illustrated by a breed of white mice, and others, 68—in a state of nature, these are apt to be lost, and why, 65—coloured poultry, horses and cattle, how to be accounted for, 65—and why sheep are generally white, 65—other qualities besides colour may be perpetuated in breeds, 66—hornless breeds of cattle, 67—one-eared rabbits, and other accidental natural defects perpetuated, 68—accidental defects from maiming sometimes descend to the posterity, 69—uses that man may make of this, 71—exemplified in regard to British running horses, and Arabian, 72—Mr. Bakewell's system of improving the breeds of domestic animals condemned, 75—general conclusions on this subject, 80—varieties of vegetables, mongrels of that sort may be obtained, 87.
 Varieties of plants, observations on, iv. 70—apples, 74—vines, 75—possibility of obtaining grapes that ripen in Britain perfectly well, 76.
 Varieties in the domestic classes of animals—those of the bos tribe, iii. 1—81.
 Variety with uniformity defined, iv. 450.
 Various kinds of meat afforded by different breeds of sheep, ii. 245.
 Vegetation instantly renewed by the rain in India, ii. 260.
 Vegetables, general disquisitions concerning them, i. A. 48.
 Vegetables, their utility in the universe, i. N. 18.
 Vegetation, on, in general, i. A. 34.
 Vegeto-animal productions, remarks on, i. M. 266—horns, hairs, spines, feathers, particulars respecting their growth, 267.
 Vegeto-animal productions differ from vegetables, and how, i. M. 268.
 Ventilator, one produced by the action of the sun only, iii. 470—prisons might

I N D E X.

be thus kept dry and sweet, 418—and warmed in winter, 418.
 Ventilating a hot-house, how it may be done without cooling it, i. M. 167.
 Vermiform insect may be cut into twenty-six parts, and each become a new perfect animal, ii. 98—propagates by a natural division, 90.
 Verax on Indian weed, iv. 477.
 Vessels for the dairy, remarks on, iv. 1.
 Vessels of the dairy, how to keep sweet, iv. 89.
 Villager, rural, hints from, i. M. 142.
 Vine, Mr. Forsyth's method of managing it, i. M. 120.
 Vines, how they may be reared in a warm house, so as not to derange the proper management of it, i. M. 171.
 Vines, on the mode of obtaining early sorts, iv. 75.
 Vineyards, on the question whether these were ever known in Britain, iv. 75.
 Vine-fretters, see Aphides.
 Vinous process described for obtaining a spirituous liquor from milk, iii. 344.
 Violet, address to, iv. 71.
 Viviparous animals, what, ii. 22.
 Viviparous flies, account of, iv. 260.
 Volatile alkali cures the bite of a snake, iii. 224.
 Voltaire altered the mode of writing history, iii. 37.
 Volvox globator, its singular mode of propagating, ii. 105.
 Verticella rotatoria, see Rotifer.
 Vorticella umbellaria and anastatica, how propagated, ii. 177.

W.

Waggons, a dissertation on the means of improving their construction, iv. 94.
 Walbrook, St. Stephen's church, criticised, iv. 463.
 Wales, mountains, views of, i. M. 31.
 Waltonian, an old, on Indian weed, &c, iv. 395.
 Washington, general, notices of, ii. 460—letter from, 466.
 Watchmen, the intolerable dissonance they make, complained of, i. M. 245.
 Water, in freezing, its amazing expansive power, i. N. 37.
 Water, a beautiful basin of, iii. 454—459.
 Water, for the purpose of a farm, queries respecting the mode of obtaining it, iv. 152—answered, shewing how it may be obtained in abundance in any part of Britain, 155.
 Water-drinker, a, on the filtering machine, i. M. 285.
 Watson, Gabriel, the great loads his horses carry with ease, iv. 101.

Weakness of waggons remarkable though clumsy, iv. 105.
 Wealth of ancient monarchies, whence it arose, iv. 466.
 Weather, rules for judging of the changes that are likely to take place concerning it, i. A. 84.
 Weeds, operations in agriculture calculated to extirpate them, i. A. 41.
 Weight of a waggon for the road, iv. 97.
 Weight of different breeds of sheep and proportion of wool, iv. 177.
 Weight of waggons, evils that result from it, iv. 104.
 Weight that can be drawn by one horse in a cart and in a waggon, 97.
 Wells for collecting cool air, how to be formed, i. M. 210.
 Wells, an easy way of forming them, iv. 156.
 Welsh sheep, ii. 164.
 Westminster-hall, the roof of, observations on, ii. 288.
 Westminster-abbey, its architecture noticed, iv. 388.
 Wheat, how it may be debased, i. N. 93.
 Wheat, valuable varieties of, i. 10.
 Wheel insect, see Rotifer.
 Whey, its qualities and uses, iii. 345.
 Whins, see Ulex Europæus.
 Whitehall, the palace of, characterised, iii. 292.
 White mice and blackbirds, how produced and perpetuated, i. N. 63.
 Wickliff, a reformer worthy of imitation, ii. 202.
 Wild ass of scripture, iv. 326.
 Wilks, Mr. his experiments on iron railways, iv. 200.
 Willow, weeping, a fine sort, i. N. 96.
 Willow, the Babylonian, a beautiful tree, iii. 455—458.
 Windows, Gothic, peculiarities of their construction, iii. 129.
 Wing of the earwig singularly curious, described and figured, iii. 352.
 Winking, ironical uses of, iii. 471.
 Winter food for cows, the best sort, iii. 244.
 Winterton Indiaman, see Madagascar.
 Wood, how to employ it economically, i. M. 130.
 Wood-lice, see Aphides.
 Wooden vessels the most proper for the dairy, iv. 3.
 Wool discriminated from hair, ii. 91.
 Wool, equally fine yielded by Spanish sheep in Britain as in Spain, ii. 172.
 Wool, produced from English sheep in Jamaica, of the same quality as in England, ii. 8.
 Wool, Dr. Parry's experiment on the improving of its quality in Britain, iv. 171.

I N D E X.

Wool, value of, in different breeds of sheep, iv. 175

Wool, cattle that afford it—the bison, iii. 9—Chittigong cow, 10—Yak of Tartary, 11—Musk ox, 14.

Wolves scared by a string trailing, i. N. 12.

Writing, the utility of it in forwarding mental improvement, i. M. 87.

Wren, sir Christopher, iii. 293.

Y.

Yak of Tartary affords a thick fleece, iii. 11.

York cathedral, iv. 390—457—465.

Young Inquirer, a, observations by, i. M. 126.

a Young Inquirer's account of Guinea sparrows, iii. 189—respecting slugs, 156.

Young Inquirer, on slugs and snails, iii. 475.

Young Observer, a, on the improvement of fruit-trees, particularly vines, iv. 72.

Z.

Zebra, the, iv. 325.

Zebu carries a close pile of hair, iii. 6.

E R R A T A.

Page 36, line 13 and 1, transpose the letters B and D,

.... 164, line 4, for "Turnbull," read "Turner."

.... 173, line 5, after the word "arguments" put a comma.

.... 173, line 13, for "rowth" read "improvement."

.... 180, line 6, for "tr. le," read "double."

.... 194, line 5 from bottom, for "much about," read "so nice about."

.... 199, line 7, for "ferft," read "firft."

.... 199, line 2 from bottom, for "Cric," read "Crich."

.... 200, line 6, for "Northampton," read "Nottingham."

.... 200, line 14, for "in Derbyshire," read "in and near Derbyshire."

.... 207, line 8 from bottom, for "100l." read "25l."

.... 208, line 16, for " $\frac{3}{4}$," read "3s. 4d."

.... 208, last line, for "one eighth," read "one twentieth."

.... 212, line 4, for "subjectes," read "subjectis."

.... 217, line 15, put a comma between the words "committed, &c. in."

